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THE ELECTRICAL WORLD
A Weekly Review of Current Progress in Electricity and its Practical Applications

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Vol. VIII. NEW YORK, JULY 31, 1886. No. 5.

THE progress in the use of electric motors is well exemplified in these pages to-day by the numerous articles, illustrations and items referring to a variety of installations and applications all over the country. They who have foresight will be quick to note these signs of the times. The electric motor has a utility not second even to that of the steam engine.

THE beautiful city of Albany is now celebrating its bicentennial in a most elaborate manner. Electricians find a special interest in the fact that the work of Prof. Henry in the telegraph is given its appropriately high place among the memorials that entitle the old city on the Hudson to the respect and admiration of the visitors now thronging her gates.

IT will be seen from an item in our "Telegraph Notes" that the laying of the cable from British Columbia to Australia is looked upon as an event that may occur in the near future, and that government support will be given to the enterprise in the shape of subsidy. Meantime the Canadian Pacific telegraph lines will connect eastward with the Mackay-Bennett cables. Altogether there is no little activity in the cable field. Brazil, also, is ready to support the new cable of which we give particulars.

THOSE who visited the Electrical Exhibition at Philadelphia in 1884 will be interested to hear that the building is now in course of demolition. It is, perhaps, a pity that the building could not have been permanently devoted to amusement and recreation of a high character. There are many of us who will remember with pleasure the hours there spent. Electricity in America has certainly been immensely benefited by the exhibition plan carried out so admirably by the Franklin Institute.

THE statement by the directors of the Anglo-American Telegraph Company of the reasons that induce them to favor a continuance of low cable rates is interesting. It shows a keen appreciation of the points to be taken into account in making a radical change of policy, and it would be worthy of applause could one feel satisfied as to its sincerity. On this latter score great doubt prevails, so great, in fact, that rumors are freely bandied as to the intended return to higher rates in a month or two. Our columns contain some close calculations on the present revenues derived from the rates now prevalent, judging from which it is not very clear why the "pool" companies should indulge in dithyrambs over doing business as a charity to the public.

THE proceedings of the Electrical Subway Commission and the Consolidated Construction Company continue to serve as a theme of general comment and criticism. There is little to add to the exhaustive presentation of the case made in our pages last week, save that the plans then published have rapidly been matured and pushed to execution. Controversy still wages as to the constitutionality of the Commission, but nothing definite has been done in the way of proving unconstitutionality. It is said that the Western Union Company denies the powers of the Commission. As we have ourselves seen letters from the company to the Commission asking permission to do work on poles and wires, we do not give much credit to the statement. One important question looming up is that of compensation for the wires and poles that will be destroyed. It seems to us that the electrical companies will have a valid claim against the city for the property that will be swept away, and the sum is not likely to be a small one. Still that is not likely to be considered a reason why the work should be hindered, for should the city dispute the claim the matter can be settled in the courts.

AFTER several months' trial of the synchronous multiplex system, which has been exhaustively described by us, the English government has adopted it in its postal telegraph system, and has now begun to pay the Standard Multiplex Telegraph Co., the owners of the system, a regular royalty, which will continue during the life of the patents. The English postal telegraph department has begun the manufacture of the motors and accessory apparatus, and is introducing the system on its lines as rapidly as possible. The system was awarded a gold medal at the late Inventions Exhibition in London. Mr. P. B. Delany is now in Germany, with the object of introducing the invention in that country. He has a line working sextuplex between Berlin and Hamburg using ink-recorders instead of sounders. The German government has also sent three experts to England to examine and report upon the system in operation there. We have had occasion to remark in the past that government control of the telegraphs usually stands in the way of progress and improvement in that field, but in this instance we are glad to note an exception in the rapid introduction of a decided improvement. The step is due probably to the quick discernment and liberal views of Mr. W. H. Preece, the chief electrician of the English postal telegraphs.

THE great expense attending the construction of copper lines for long-distance telephony has naturally led those engaged in solving the long-distance problems to seek means for increasing the capacity of the wires. The steps to be taken are analogous to those adopted in the case of the telegraph, where the duplex and quadruplex have greatly increased the value of the lines. It is not hard to believe the report, therefore, that the American Telephone and Telegraph Company, a description of whose lines between New York and Philadelphia we gave lately, is now undertaking experiments with the object of duplexing its wires, and thus practically doubling their capacity and utility. Several methods of duplexing telephone lines have already been proposed and have been the subject of discussion and trial among telephonists, but they have not come into use, in this country at least. The delay has been due probably to a lack of necessary incentive, such as the long-distance service now furnishes. While the difficulties to be overcome in the duplexing of telephone lines are greater than with the telegraph, it is safe to say that satisfactory results will in time be attained. We understand that the work in the present instance is in highly competent hands, and even now gives excellent promise of developments scarcely hoped for.

THE only strong objection that has until recently been raised against the use of the incandescent lamp in mines is that being hermetically sealed it gives no indication of danger, as does the universal Davy lamp. Even this objection has now been removed by a comparatively simple device, which will probably be improved upon in time. It ought to be ever borne in mind by inventors that they must embody their ideas in the most simple practical appliances, especially when such apparatus is to be put in unskilled hands. As regards the particular case under discussion, it is well known that various contrivances have been invented to act as fire-damp indicators, some indeed of very simple construction, though not always, for, in one recent example, the inventor designed apparatus occupying several cubic feet of space and containing a delicate balance intended to weigh continuously the air in the mine. This apparatus, although operative, would, we fear, at once be condemned by the practical man on account of its cumbersomeness and the care required in its manipulation and maintenance. To the credit of the inventor be it said, however, that he gave the free use of his invention to the world. To come back to the incandescent lamp, it is likely that as coal in the pit costs practically nothing, the time is at hand when the miner's lighting outfit will consist of the electric lamp and small storage battery, or even primary battery.

THE method employed by the English military telegraph corps, in which the telephone is used as a sounder, and which has been kept secret for a number of years, is one which has already been practically applied in this country in the systems of telegraphing to and from moving trains. This method consists of converting the single clicks in the telephone which make it difficult to distinguish between dots and dashes, into musical notes of longer or shorter duration. This is accomplished by the use of a vibrator in the circuit. Capt. Cardew's paper, given on another page, brings out, however, the important point in the working of the telephone that little insulation is required by the line. In fact, some of the lines named by the author may be considered as practically *uninsulated*, or rather grounded, and yet they continued to work satisfactorily. For military purposes this must be a great advantage, where quicker movements of troops require a rapid running of the line. Indeed it would almost appear that poling is an unnecessary refinement for a military telephone line, so far as electrical communication is concerned. There is, however, claimed to be one disadvantage in the use of the telephone or other forms of sounder for military purposes, which consists in the fact that they leave no permanent record. Where orders for movements of importance are transmitted, some authorities assert that a record is of the first importance, as it constitutes a check upon both the sender and receiver.

TO WHAT uses electricity can be put on the farm is well demonstrated by the short note in another column, giving an account of its manifold applications on the estate of the Marquis of Salisbury. A "resident electrician" is indeed a novelty, but the indications are that we shall have more in future. As the ease with which dynamo-electric machinery can be handled, and the little care it requires become better known, the "engineer" of many an establishment will be transformed into a "resident electrician." Already the ease and cheapness with which an installation of dynamo-electric machinery is maintained is thought to surpass that of any other like kind of power apparatus. Once it is put in operation little more than ordinary intelligence is required to maintain an electric plant. Mr. Holroyd Smith, the consulting engineer of the Blackpool electric tramway, now running so successfully, writes: "I am thankful to say that my professional services are seldom required, for the problems I had to solve have been reduced to such simplicity that others previously unacquainted with mechanical science can now undertake the arrangements." This admission may surprise many whom the mention of the word "electricity" fills with a sense of awe and mystery, and who regard electrical applications as demanding unusual precautions and extra skill, yet all who have anything to do with electrical apparatus know that it is so true and obvious as to be almost beyond the necessity of statement. We are even inclined to think that sometimes the simplicity of electrical apparatus is abused, because too much dependence is placed on the machine and too little on the intelligence of the men who operate it or have the supervision of it. In this respect, however, there has been of late a marked improvement, and one noteworthy sign of the change is the emphasis with which Col. Flad, the President of the American Institute of Civil Engineers, told the society in his address at Denver last month that the civil engineer to-day to be master of his profession must be as familar with electricity as with hydraulics.

REVIEWS OF NEW BOOKS.

ELECTRIC TRANSMISSION OF ENERGY; and its Transformation, Subdivision and Distribution. By GISBERT KAPP, C. E. New York: D. Van Nostrand. 1886. 325 pp., 12mo. Price $3.

In this excellent work, Mr. Kapp has endeavored, as he says, to place before the reader an unbiased report on the present state of electric transmission. If we may be allowed to amplify this description of his work we should say, that while not neglecting practice, his aim seems to have been chiefly in the direction of a scientific discussion rather than a purely practical one.

In the first five chapters the author treats of the fundamental principles upon which the action of the electric motor depends. Chapter II. contains a very interesting account of the effect of self-induction, a subject which deservedly requires more extended treatment than has so far been accorded to it. The author evidently has recognized its importance, and he gives the results of some experiments made with motors of the shuttle-wound Siemens armature type. He shows that the increase of current at the dead point, due to the short-circuiting of the armature in a *series wound* motor of this type, is checked by the self-induction which opposes any sudden change in the current, and the current becomes simply undulatory. But the case is different if the motor be shunt-wound and fed from a source of constant potential. Since the field magnet coils are now excited independently from the current which passes through the armature, their self-induction cannot in any way steady that current, and abrupt changes in strength and great waste of electrical energy must occur at the dead points. This, as the author remarks, is a matter of considerable practical importance, and shows that motors with shuttle-wound armatures should never be used coupled up otherwise than armature and field magnets in series.

In discussing the relation between dynamo and motor, the author remarks that while a separate investigation as to the theory of motors might almost seem superfluous, experience has shown that although the reversibility of the dynamo exists, it is not always the best dynamo that makes the best motor. This is not altogether at variance with the conclusion recently arrived at by some experimenters, and when confined to certain details is undoubtedly true. These details are, of course, dependent upon the class of work the motor is designed to perform, and the differences brought about are those which circumstances dictate as an absolute necessity. Hence, the author is justified in considering what changes these considerations must lead to.

The type and character of field magnets occupy a prominent part in the treatment of the motor from the magnetic standpoint in Chap. IV., and several important considerations in relation to this part of the subject are brought out. This is supplemented in Chap. V. by a thorough consideration of the efficiency of the electric motor and the influences which affect and control it. It would carry us too far to enter in detail into this part of the subject, as the author discusses it, but taken in connection with the chapter treating of the regulation of motors, this part of the work bears the stamp of individuality and power of close reasoning, and it cannot fail to be suggestive to the intelligent reader.

Having thus far confined himself to the motor as such, the author in the remaining chapters deals with the problem of practical distribution of power. Naturally the first thing to be considered here is the conductor, and in treating of this a careful selection has been made of the tables arranged by Prof. Forbes and other eminent specialists, and the economical side of the question is conspicuously brought out, as it should be.

The details of the construction of lines are not neglected, and the subjects of insulation, material, and methods of distribution are all treated of at some length. In the final chapters the author gives an account of the various applications to which the electric motor has been adapted, and he ends with the experiments of Marcel Deprez.

In view of the general excellence of the work, it would be invidious to point out minor defects. If we made a suggestion it would be that the details of practical, existing examples might be greatly extended, so as to give the student a comprehensive view of what has been accomplished and in what manner.

Taken as it stands, however, the book contains much valuable information, and must be accorded a prominent place among the few standard works on the subject. Its value consists not only in what it contains, but also in the many suggestions thrown out, which will act as a stimulus to thought and investigation.

Electric Lighting at the Portuguese Royal Wedding.

In connection with the festivities on the occasion of the recent royal marriage in Portugal, numerous nocturnal displays were made. The one which attracted the most interest was the electric lighting of the royal palace of Ajuda, carried out by Messrs. Woodhouse & Rawson, electric light engineers, of London.

On either side of the wide approach to the palace were fixed poles covered with crimson cloth, bearing gilt spear-head tops, from which were suspended six powerful arc lamps, besides two suspended over the arcade at the entrance of the palace. The dynamo and engine were fixed in an outhouse behind the large quadrangle of the palace. Thanks to the elevated position which the palace enjoys, the lights were witnessed not only from the bar of the Tagus for several miles of its length, but also from the greater part of the city, and even from the villages of Cacilhas, Barriers, etc., and the historic castle of Palmella far up the river.

The lighting gave general satisfaction, and was very favorably spoken of by the press.

The confusion which must inevitably have been caused by the thousands of carriages which conveyed visitors to the State dinners and balls, would, but for the services of Messrs. Woodhouse & Rawson, have been indescribable. The king expressed his satisfaction at the perfect steadiness and general effect of the light.

The "Krotophone"—A New Form of Telephone.

Many variations have already been devised upon the telephone receiver in every-day use, and few possess such

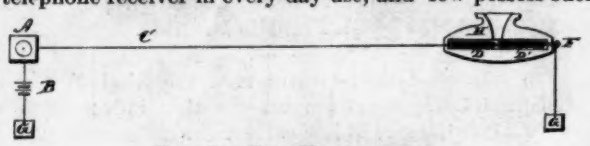


FIG. 1.—THE KROTOPHONE.

decided novelty as to attract more than a passing notice; but a form of receiver which has recently been devised merits some attention, as the inventor does away with the use of all magnets, diaphragms, helices, secondary currents or induction coils. The principle upon which Mr. Edward S. Spaulding, of this city, the inventor of this novel instrument, bases its operation, consists in reproducing the human voice through the medium of crepitations or minute crackling sounds or detonations. He accomplishes this by causing the original disturbances in

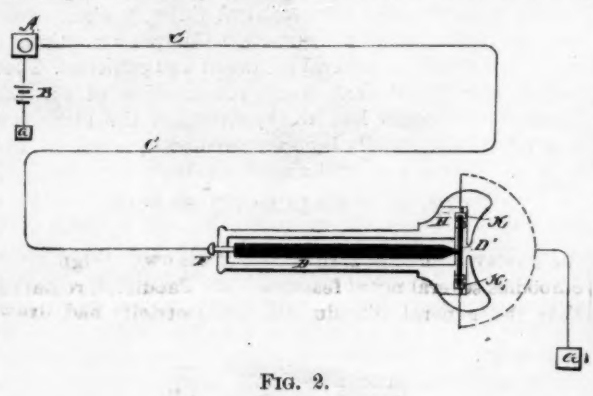


FIG. 2.

the transmitter to be sent over the line so as to affect the receiver and cause it to give forth a series of crepitations or intermitting detonating sounds.

The illustration, Fig. 1, shows the original form of instrument employed, and Fig. 2 the modified and improved apparatus. As in the ordinary system, any form of microphone transmitter shown at *A* may be employed. Within the case *H*, Fig. 1, there are two carbon points *D D'*, which form part of the circuit *C*, one of the points *D* being rigidly secured in the receiver *H*, and the other

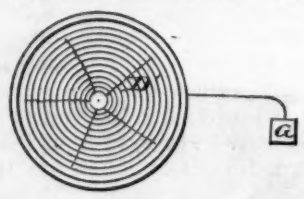


FIG. 3.

point *D'* being adjustable with reference to the other point by means of the screw *F*.

This constitutes the entire receiver. The theory upon which the instrument operates is so novel that we prefer to give it in Mr. Spaulding's own language, as set forth in the patent recently granted to him.

"For the sake of illustration we will assume that the circuit consists of a battery, line, and the receiver shown in Fig. 1 be used as a transmitter, and a similar instrument be used as a receiver proper. Assuming that the current passes through the carbon pencils in parallel lines, any disturbance of the point of contact of these pencils in the transmitter will produce a series of crepitations, which cause a series of corresponding electrical impulses to be transmitted over the circuit. Referring to the receiver, this circuit, passing in parallel lines through the pencil *D*, causes its points of contact with the opposite pencil *D'* to vary by reason of the elongation and contraction of the pencil *D*, due, for want of a better term, to the polarization of the molecules or atoms of the pencil. Now, assuming that through the pencil the current passes in a series of many parallel lines, then the movement of the atoms in each of these lines would be uniformly similar and in parallel lines, and thus a disturbance created in the receiver corresponding to the impulses affecting it, which impulses in turn correspond with and depend on the primal disturbances in the transmitter. Now, then, it being shown that the polarization or disturbance of the atoms in the pencil *D* in the receiver is produced, I have noted that this result is accompanied by a series of crepitations or crackling sounds, which are clearly distinguishable from even the faintest sounds when produced by vibrations or other cause, and from this distinction I infer that the said crepitations are strictly 'neutral,' and so denominate them. Therefore, as such crepitations are individually neutral when they are arranged in constantly-varying groups, corresponding exactly to the primal disturbances which cause them, and thus if articulate sounds be the primal cause of the disturbance in the transmitter, articulate sounds will be the effect in the receiver."

Mr. Spaulding has found that when two pencils of carbon are used as the receiver the sounds will be audible and distinct, but faint; and, to overcome this objection, he replaces one of the pencils by a plate of carbon of such size and quality as to be non-sonorous and non-vibrating, as shown in Fig. 2. This plate is provided with a circumferential ring *K*, and the plate *D'* has a suitable elastic packing-ring, to prevent fracture when rigidly secured in place in the holder *H*. In this form of receiver the current passing as before in parallel lines through the pencil *D*, and thence to the plate *D'* from the point of contact of the pencil, the current then radially diverges in every direction toward the metallic ring, and thence to the ground, as before. This construction gives an amplified sound, and this effect Mr. Spaulding attributes to the radial or diverging paths the current takes. In the first form of receiver described the current passes in parallel lines, and the movement of the atoms on each of these lines is uniform, and consequently the crepitations are faint; but in the second instance these several lines are not parallel but divergent, and increased crepitating effect is produced.

The illustration Fig. 3 shows the circumferential connection of one of the carbon points.

A Strong Recommendation of Electric Lighting.

Some little while ago a special committee of the city government of Kingston, N. Y., was appointed to examine the different systems of electric lighting and to report thereon, with a view to the adoption of arc lights for street purposes. The report of the committee has now been presented to the Board of Aldermen, giving an account of its labors and of a special visit paid to Hornellsville, N. Y., to see the system there. It appears that the committee made a special examination of the American system, a proposition for the use of which was made to the city by the American Electric Manufacturing Company, and that the inspection proved very satisfactory. The visit to Hornellsville was then paid.

"On the following day, to wit, the 29th, your committee went to Hornellsville, as instructed, in order that it might see the last electrical plant and station established by the American Electric Manufacturing Company for street lighting, in full operation. Here we found the best opportunity as yet presented for observing the utility of the electric light for street illumination as it would be applied in our own city if adopted. Hornellsville is a village of about 13,000 population. It has seventeen miles of streets, nearly all of which are more densely shaded than any portion of this city. The village is lighted by fifty-five 'American' duplex lamps of 2,000 standard candle power each, several of which, by actual measurement, we found to be over 1,100 feet apart. These fifty-five lamps displaced 227 gas and oil lamps. From our observation the village is thoroughly and amply lighted, and the residents with whom we conversed so expressed themselves, and as being much gratified with the substitution of the electric light for gas, not only because of its greater illuminating power, but also for the reason that they are now provided with light all night long, and every night in the year, while heretofore the village was lighted with gas and oil lamps for about 25 nights of each month, and then only till midnight. Our investigation at Hornellsville was very thorough. We personally examined the engines, boilers, apparatus and machinery in the station, and inspected every one of the street lights in use in the village, thereby obtaining much information upon the subject generally, most of which requires too much detail to embody in this report.

"It is well to add here, however, that in many places in Hornellsville where the foliage is particularly dense, the lamps are suspended in the centre of the intersectional points of the street in such a manner as to give the streets, at their intersection, the full benefit of the light thus suspended. By this method the illuminating power of the lamps is utilized to its fullest capacity, thereby diminishing the necessity of the multiplicity of lamps, which would otherwise be required to overcome the heavy shade of the trees. It was also observed that the best effects are produced by the lamps when placed at an elevation of from 25 to 30 feet.

"Wherefore, and in view of the foregoing facts, the members of your committee have unanimously reached the following conclusions:

"That it is every day becoming more and more apparent that the electric light possesses great advantages over gas and all other illuminants, whether from the standpoint of safety, comfort, convenience or even economy, and that it is demanded by the public and insisted upon as a necessity.

"That in Hornellsville it is practically demonstrated that a town with 17 miles of closely shaded trees, is thoroughly lighted with 55 lights, and that the same ratio of lights to distance applied in this city, will give as satisfactory results as in Hornellsville.

"That in our opinion the 'American System' of electric lighting is, in all respects, equal to that of any other, and in some features—such as automatic regulation, steadiness, brilliancy and power of its light—possesses decided advantages over any other system we have been able to observe.

"Wherefore, your committee respectfully recommends that the petition of the said American Electric Manufacturing Company for permission to erect such poles and fixtures, and to hang such wires thereon, through and upon the streets and highways of this city, as may be necessary to enable it to carry on the business of electric lighting, be granted, and that its proposition to supply one hundred arc lights of 2,000 standard candle power for lighting this city, to be placed or located by a committee appointed for that purpose, be accepted."

This report was signed by Nelson Stephens, Mayor; W. Scott Gillespie, Augustus H. Van Buren and Henry Beck, Aldermen.

Civil Engineering and its Relation to Electricity.

At the late meeting of the American Institute of Civil Engineers at Denver, the President, Col. Henry Flad, delivered an able address on "One Year of Engineering Progress." He took special occasion to refer to the development of electricity, a knowledge of which he regarded as indispensable to the civil engineer of to-day. Touching on specific points, he said:

"A new problem is pressing itself upon the attention of the municipal engineer, one that presents special difficulties, and will require his best endeavors to satisfactorily solve. This is the proper method of arranging and carrying the numerous wires required for the electrical appliances which are now used in our cities and towns. In the larger cities, where space is limited and the purposes to which electricity is applied are various, necessitating the employment of all kinds of electrical currents, many of which act injuriously upon each other, the electrical difficulties to be overcome are great, and by many are considered to be of such magnitude as to forbid the use of routes or ways in common. In the larger cities the public demand that the wires shall be placed under ground, and undoubtedly they must be so placed to greater or less extent. The electrical difficulties need not be considered here. The engineering difficulties are in themselves of sufficient importance. The solution of the problem which most naturally suggests itself is the bulilding of large subways in which all the wires may be placed as well as the water and other pipes, pneumatic tubes and other modern appliances; the subways to be of a size admitting men to enter at convenient points for placing and repairing the wires and pipes without interfering with the street traffic. The cost of such subways would be so great as to forbid their construction except to a limited extent. On the other hand, the use of small conduits or tubes, into which the wires shall be drawn through numerous openings in the street surface, will necessitate almost constant interference with traffic and frequent disturbance of the pavement of the streets and sidewalks for enlargements and repairs and for making connection with buildings. I am inclined to think that what may be designated as the mixed system would be the most satisfactory, under which large subways would be used on streets where the number of electric conductors and of pipe lines required for all purposes was sufficient to warrant expenditure for such structures; while, for the other streets, a system of aërial carriage and distribution might be devised which would be free from the gravest objections to the present practice, and which would admit of gradual expansion, without interrupting traffic, until the proper time for the construction of a subway had arrived."

With regard to motors for street passenger service, Col. Flad expressed the opinion that while for short lines cables had some advantages, "for long lines the use of some other motor will probably be found more economical;" and he went on to call attention to electricity as the needed motive power.

"Electricity. for several years has been in use for operating city and suburban tramways. There are different methods of carrying the electric current from the central station to the cars. In almost every case a separate conductor is used, either over ground, as at Berlin, Baltimore and Giant's Causeway, or in slotted conduits similar to those used on cable tramways, but of smaller dimensions, as at Cleveland and on the Blackpool line. Electric tramways have been tested during the year or are now in process of construction at Toronto, New Orleans, Minneapolis, Detroit, Montgomery, Ala., Denver, Col., Appleton, Wis. Different from these systems is that of Reckenzaun, who carries the electricity for operating the motor along with the car in a storage battery. This system is now being tried at Battersea, England. If storage batteries can be constructed, which, besides being light and durable, will return a fair percentage of the amount of the power used in charging them, this system would give promise of great economy and convenience.

"The rapid development of the application of electricity to many of the necessities and comforts of civilized life would seem to demand that more attention than heretofore should, by the profession at large, be paid to this branch of engineering. A knowledge of this science will, within a few years, be just as necessary to the civil engineer as is to-day the knowledge of hydraulics."

The "Challenge" Motor.

At a recent meeting of the Electrical Section of the American Institute, Mr. John M. Pendleton exhibited to the society a small electric motor of his own design which embodies several novel features. Mr. Pendleton remarked that the general introduction of electricity had drawn considerable attention to electric motors lately from the recognized fact that power is not only more readily transmitted by electricity, but also on account of the facility with which it may be subdivided and distributed without loss—a point in which neither steam nor gas engines can compete with it.

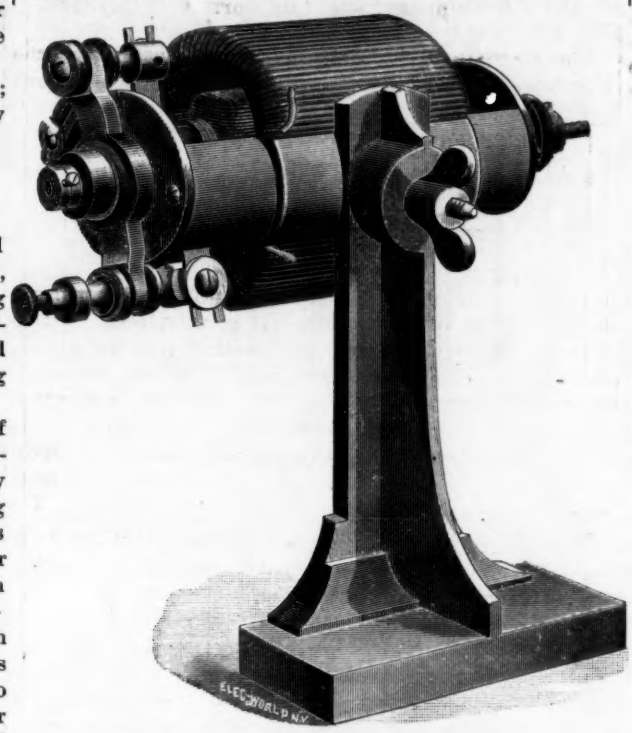


FIG. 1.—CHALLENGE MOTOR.

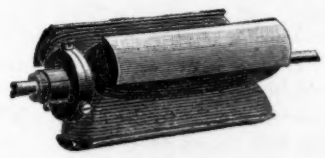


FIG. 2.—ARMATURE OF MOTOR.

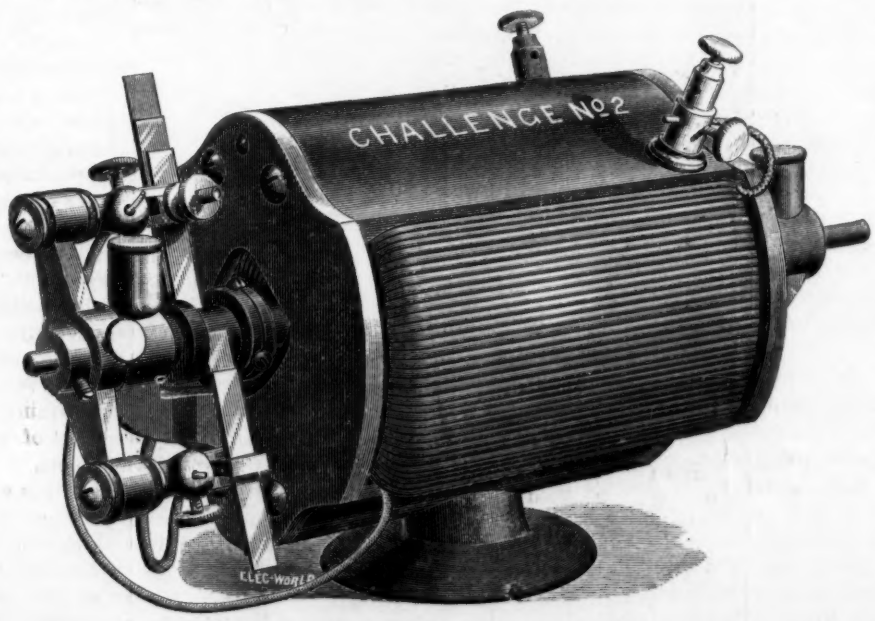


FIG. 3.—CHALLENGE MOTOR NO 2.

The motor, which is shown in perspective in Fig. 1, weighs forty ounces, and is capable of developing power sufficient to run a sewing machine or other light running apparatus, such as a dental drill, mallet or a fan.

The armature of the motor, which is shown detached in Fig. 2, is of the three-pole type, and each of the three segments of the commutator is consecutively cut out in such a manner as to reverse the polarity of the pole of the armature so that for one-half the distance of the pole-piece attraction takes place, and during the other half repulsion.

This construction obviates any dead point, and the motor starts instantly at any position of the commutator. This is evidently an indispensable quality in a motor designed to operate intermittently, stopping and starting at frequent intervals. Such work also frequently requires a change in speed, so as to run fast or slow, and this has also been provided for, by making the brush-holder adjustable. The latter is controlled by a spring which normally maintains it at the position of maximum speed. By rotating the brush-holder, however, the position of contact and hence the speed, can be varied at will from the maximum down. This shifting of the brushes does not require any manipulation by hand, but is accomplished by a cord attached to a treadle, thus leaving the operator's hands free to guide the work.

The manufacture of this interesting little motor has been undertaken by Mr. Chr. E. A. Grönbeck, of No. 41 Centre street, this city. The engraving, Fig. 3, shows a larger size of the same type. The latter weighs 20 pounds, and is said to be able to develop as high as one-quarter horse-power.

Preparing for the New York Electrical Subways.

Since our issue of last week, in which five illustrated pages were devoted to the work of the Subway Commission and the terms of its contract with the Consolidated Telegraph and Electrical Subway Commission, there has been much discussion as to the personnel and plans of the company and the value of the contract it has gained. It is figured by some that the company can earn from 15 to 20 per cent. on an investment of from $3,000,000 to $4,000,000, while others contend that even if the company has no fights with other corporations, it will not make money. The constitutionality of the proceedings thus far finds many deniers and as many enthusiastic supporters. In more than one quarter it is held that as the electrical companies have been allowed to put up their wires and poles, they cannot have their property destroyed without compensation on the basis of an appraised value, and it is further held as the underground law makes no provision for this, it must be unconstitutional. On the other hand the commission claims legality for its existence and conduct, and has eminent legal opinion in support of its every action. As to the intentions of the electrical companies, some doubt is felt. The Western Union Company for several months has had experts at work on a subway system, and the one that has been selected by it the company declares that it will put down despite the Subway Commission or its plan. Mr. Somerville, in speaking of the Western Union Company's stand in the matter, says:

"I am as yet unable to say definitely what we will do in regard to the plan sent to us by the Subway Commission. It has been considered, but no action has been taken on it. This company would very much prefer to lay its own wires as it pleases. We have a satisfactory system now in operation to our uptown office in Twenty-third street, and I cannot see why we should be made to change for another. The Commission's plan may be all right, but before we give it our approval, we shall inquire of our counsel whether the Commission has the power to compel us to use the conduits that it may build. Messrs. Dillon and Swayne, the counsel of the company, are examining this view of the subject for us, and till they send in an answer I can only say that it has not been decided to obey the Commission."

Mr. Flower's comment is: "I have sent experts repeatedly to Dr. Green and General Eckert, and on each and every occasion the answer they have brought back was that the telegraph people had no plan or suggestion to offer, and, in short, that they had nothing to do with us. They seemed to regard the work of the Commission as an impracticable piece of business and a job, and would give us no information as to what they wanted, or what they were willing to do. They talk now about wanting to put their own wires underground. Why haven't they done so? They have had time enough. I have every reason to believe that the act constituting our Commission is all right, and this judgment is backed by the soundest legal opinion."

At a meeting of the Subway Commission on the 27th inst., the contract was formally signed, sealed and delivered, the Consolidated Company accepting the written interpretation by Mr. Gibbens, counsel for the Commission, of the terms of the contract. Messrs. Flower, Hess and Moss signed for the Commission, and Messrs. Fitzhugh and Sefton for the company. Mr. J. Thomson, engineer of the Commission, then stated that he would make a report on the specifications of the work by next Tuesday. The company now has use, it is understood, of the Dorsett, Williams and Edison patents requisite for carrying out the plans intrusted to it for execution. It is said that the recent events in New York have greatly stimulated activity in underground matters in other cities.

The Jury Compact in the Farnsworth Suit.

The following story is told in the New York *Times*, by the omniscient *flaneur*, "Halston":

If one of my friends is as well informed as he thinks he is, there must have been some very lively times in the room where the jury in the recent big telegraph suit was locked up to determine upon a verdict. After the lawyers had made their speeches and the judge had delivered his charge, the jurors quickly took a ballot to test their opinions. Eight of them favored a verdict assessing $1,200,000 damages against the Western Union Company, two jurors thought the damages should be $2,000,000, and another was in favor of damages even higher, but the twelfth man was teetotally determined against any damages at all. He would dismiss the suit, and let the plaintiff go without one cent. His colleagues tried to reason with him, but he wouldn't have it. He knew Lawyer Joe Choate's eloquent Western Union speech by heart, and he echoed its pleasing periods in answer to every argument from the obstinate eleven. Then came the reports to the court that the jury could not agree, reports that finally provoked what was practically a sharp reprimand, and they were sent back once more with a fair prospect of being kept under lock and key through a long, hot Sunday. This prompted something very like ill humor in the breasts of the unreasonable eleven, and that twelfth man was besieged in rather a more lively way than before. Arguments, reason, recitations of evidence were no more rehearsed; instead, there was talk that had a grating sound in it, and that twelfth man learned in a pretty clear way that there is such a thing as suspicion in this world sometimes, and that this might be one of the times. Sharp wars of words raged. Nobody was inclined to be over-generous; nobody minced words. It looked like a pretty bleak world for that twelfth juror, and he was agitated. He didn't like the things he heard; he didn't find much joy in intimations that he had to listen to. And if the opinions expressed by his fellow-jurors were in any wise the echo of the opinions of his fellow-citizens generally, he saw good reasons for desiring to escape wrath to come. Then there was a compromise. The twelfth man consented to give a verdict for the plaintiff, but a compact had to be entered into—a compact put in writing and

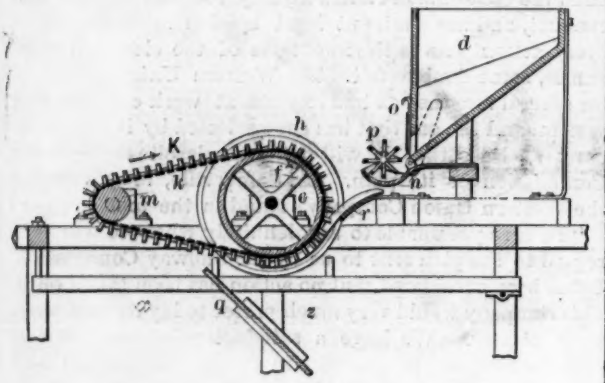


FIG. 1.—MAGNETIC ORE-SEPARATOR.

signed, it is said, by every juror of the twelve—that, no matter what circumstances might follow, no one of them would give away the secrets of the jury-room, nobody tell who had been for or against the Western Union Company. And when this was agreed to the twelfth man consented to the verdict, which was finally recorded—$240,000 damages for the plaintiff. This is a good big price for the Western Union to pay to keep its friend's name a secret; and a fall from $1,200,000 or $2,000,000 down to $240,000 is a pretty steep price for the plaintiff to pay to give eleven friends freedom on a Sunday. Some worshipers of the jury system should capture that written compact to secrecy; it would be a singularly interesting if not valuable memorabil.

Testing Mercury Ores.

The *Journal de Pharmacie et de Chimie* gives two methods for testing mercury ores invented by Señor Luis de la Escosura, chief of the staff of the Spanish mines. The second and more simple of these is the following: The mineral, finely powdered, is placed in a platinum capsule in a mixture of water, hydrochloric acid and sulphite of ammonia. For a mineral with 10 per cent. of mercury the following proportions are adopted: Mineral 200 grams. HCl. 10 c.c.m., water 90 c.c.m., sulphite 20 c.c.m, so that about 120 c.c.m. are obtained. These proportions ought to be modified according to the richness of the mineral. The platinum capsule is placed on a support, and a gold disc is plunged into it, soldered to a gold wire which communicates with the zinc pole of a battery of a few elements. The capsule is connected with the other pole. At the end of twenty-four hours the operation is ended; the mercury precipitates itself on to the gold disc, the increase in the weight of which indicates the richness of the mineral. This simple process is, it appears, of rigorous exactness even for very poor ores containing less than one per cent. of mercury. The impurities which usually accompany mercury minerals do not interfere with the operation. This process, which has been employed at Almaden for about a year, has been found superior to all others.

Magnetic Ore-Separator.

The magnetic properties of iron evidently make it readily separable from other non-metallic metals, and in the treatment of ores this quality is taken advantage of to free more valuable minerals from intermixture of iron. A number of magnetic ore-separators have been devised, and are already in use, some of which we have described. One of recent design has been applied at mines in Oberlahnstein, Prussia. It is the invention of Herr Heinrich P. J. Kessler, and consists of a stationary iron drum, which is permanently magnetized by a surrounding coil, and over which pass soft iron pins, supported on an endless belt. As the pins are brought into proximity to the drum they become magnetized, and being passed through the mixed ore, attract and retain the iron particles. When passing beyond the magnetized cylinder the pins lose their magnetism, and drop the iron into a receptacle apart from the other material.

The accompanying illustrations, Figs. 1 and 2, show the machine in sectional elevation and plan. It consists of a

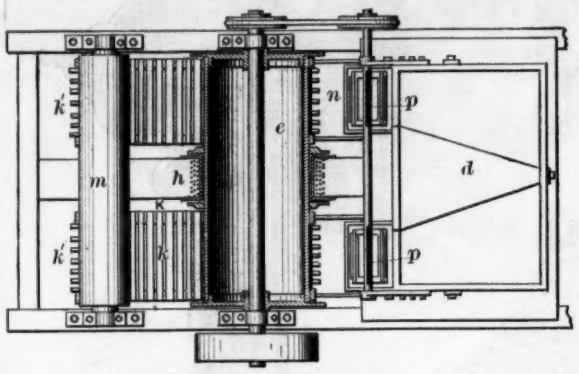


FIG. 2.—MAGNETIC ORE-SEPARATOR.

cylinder *e* made of sheet or cast iron, which is mounted on brass spiders *f* and surrounded at the middle by the fixed coil *h*, so that a current passing through the latter converts the cylinder into a magnet.

At the sides of the coil endless belts *K* are passed over the drum *e*, and over a wooden roller *m* at some distance from the drum. These endless belts consist of the straps *s*, united by transverse strips *k* of metal, from the outer sides of which the iron pins or pegs *k'* project, as shown in Fig. 3.

For the purpose of preventing the magnetization of the strips *K* after they have been passed over the drum, some of the strips *k* at suitable intervals are made of brass.

The pulverized ore is placed in a hopper *d* having an inclined bottom, at the lower edge of which the sliding door *o* is provided, and below the door a gutter *n* is arranged, in which an agitator *p* revolves, being driven from the shaft of the drum *e*. The agitator throws the pulverized ore from the gutter into a guide *r*, which is arranged in close proximity to the endless belts *K*, so that the pins *k'* of the belt pass into the pulverized ore in the guide. An adjustable inclined partition *q* is placed below the drum *e*.

The pins *k'* are magnetized as they pass over the drum *e*, and as they pass through the pulverized ore attract all the particles of magnetic ore, etc. The pulverized ore drops upon the partition *q*, and slides over the same into the compartment *z*, whereas the particles of ore that adhere to the pins *k'* are carried over the top of the partition *q* and drop into the compartment *x* as soon as the pins

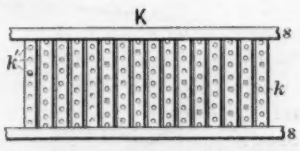


FIG. 3.—MAGNETIC ORE-SEPARATOR.

lose their magnetism, which takes place at a distance from the drum *e*. The partition *q* is so adjusted that its upper edge is near to the point where the pins begin to lose their magnetism.

In the construction shown in Fig. 4, which is a modification of the same idea, the endless belts are replaced by a brass ring or roller *t*, from which pins *k'* project, the ring resting on the drum *e* and on the wooden roller *u*. For smaller machines the pins *k'* may be replaced by permanent magnets, and in these machines the drum *e* and the wire coil forming the electro-magnet on the same may be dispensed with. The operation is similar to that of the machine shown in Fig. 1.

Thermo-Electric Couples.

An abstract of a paper by G. H. Le Chatelier appears in the current number of the Chemical Society's *Journal* as follows: Avenarius and Tait have shown that the electromotive force of a metallic couple increases between 0° and 400°, in accordance with a parabolic function of the absolute temperatures of the two junctions, $E = A(T_1 - T_0) + B(T_1^2 - T_0^2)$, or if one of the two junctions is kept in melting ice, $E = a\,t + b\,t^2$, where t is the ordinary temperature of the warm junction, and a and b are constants depending on the nature of the couple. The author finds that this law holds good for temperatures above 400° up to a certain limit which depends on the nature of the couple, and beyond which the value of the coefficients suddenly changes, whilst the nature of the equation remains the same. Values of the coefficients for platinum and platinum-iridium at different temperatures are given in the original paper. The calculated results agree well with those actually obtained, and any divergencies may be attributed to the well-known irregularities of thermo-electric couples.

The Permanence of Low Cable Rates.

Below is given the statement, already noted in these columns, of the directors of the Anglo-American Telegraph Company, in their report to the shareholders, concerning low rates:

"The reduction of the tariff from 2s. to 1s. 8d. per word, introduced by the Commercial Cable company on Dec. 24, 1884, resulted in a large decrease in the gross revenue produced by Atlantic cable traffic. Nevertheless it was determined by the Associated Cable companies to give the reduced tariff a fair trial, in order to avoid a war of rates, and to determine as early as possible whether the reduction would result in any remunerative increase of traffic. After more than a year's trial it was found that the very contrary was the case, and as the rival company resorted to means to obtain a greater share of the traffic than the possession of two cables fairly entitled them to, the directors of the associated companies came to the conclusion that it was necessary, in the interests of their proprietors, to adopt a low rate.

"Accordingly, on the 5th of May, 1886, the rate was reduced by the Associated Cable companies to 6d. per word, and by special arrangement with the Western Union Telegraph Company of America this tariff was made to extend to all the principal cities and towns in the United States and Canada. For press news a special rate of 3d. per word between London and New York was also adopted. On the same date the tariff of the Mackay-Bennett cables was reduced to 1s. per word. The effect of this important reduction of rates by the Associated Companies has been a very considerable augmentation of the traffic—much larger, indeed, than was anticipated as a

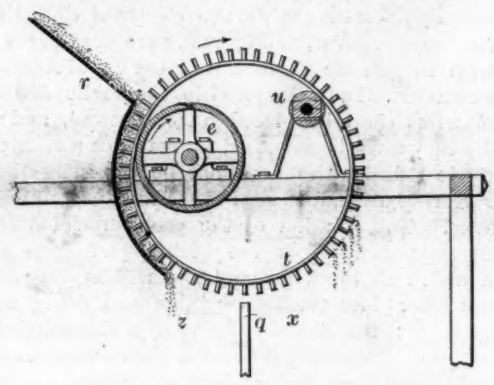


FIG. 4.—MAGNETIC ORE-SEPARATOR.

first result, amounting to over 110 per cent., and although the total receipts have greatly decreased the company is earning sufficient to pay its working expenses and to place such a sum to the credit of the renewal fund as, with the accruing interest, will soon bring that fund up to £1,000,000, the limit fixed by the proprietors at the last half-yearly meeting.

"The unexpected increase in the volume of traffic immediately upon the introduction of the sixpenny tariff has induced the directors to consider the expediency of adopting permanently a system of low rates. The associated companies possess between them no less than eight cables across the Atlantic, having a carrying capacity which, for practical purposes, is unlimited. With such an extensive system it is obviously their interest to encourage a very large traffic at low rates, and by so doing prevent a further multiplication of unnecessary cables. By the recent reduction of rates cable customers and the public have the opportunity of answering the question upon which the future rate between Europe and America will have to be decided, namely, whether there is a sufficient inherent development in the cable traffic to and from America to warrant a low charge being permanently established. If there be such development and the public respond to the desire of the associated companies to continue working at low rates, it will be to the interest of the companies to do so, as they only desire to earn a reasonable return upon the capital invested and prevent further wasteful competition. The directors would remind the proprietors that the company has now been in existence for over twenty years, and that, although high rates were in the first years of the undertaking an absolute necessity, and were not at the time objected to by any important class of the community, it has since been found that whenever they were adopted the result was continuous competition, useless multiplication of cables, and loss of money to all the companies interested. The directors believe that sooner or later a low tariff will be a necessity, and that by 'taking time by the forelock' and making an earnest effort now to establish it, they will secure the cordial approval and co-operation of their customers and the public, without which so important a step could never be successfully adopted."

It is generally remarked that this evidences a very sudden conversion to the theory that low rates are profitable—and profitable in proportion to their lowness. As to the increase of business claimed, Mr. Ward, the General Manager of the Commercial Cable Company, makes, in an interview, the following calculation:

"They may have had the increase of business they claim, but it is not true that low rates have never been tested. Low rates existed in 1881-2 for nine months, during a tariff war, and the companies lost a large amount of money. This statement is made to entice customers away from the Commercial Company. If they succeeded in doing this and compelled the Commercial to surrender to the pool, the rates would be at once put up to sixty cents, as the companies have repeatedly confessed.

"They claim an increase in volume of business of 110 per cent. They must do three and one-third times as much, or 233 per cent more business at twelve cents per word, to make their receipts equal to a forty cent rate, to say nothing of the increased expense of handling so much more business. Look at the figures:

"Total earnings of the pooled companies for 1885, at forty cents, $2,280,215. The same business at twelve cents per word would amount to $684,064. Add 110 per cent—the alleged increase—$752,470. Their yearly earnings, as per their claimed increase of volume, would therefore be, at twelve cents, $1,436,534. This is $843,681 less than last year, when their profits were so small at forty cents that they claimed it was an unprofitable rate, and they undertook their present war of rates to kill off the Commercial and put up the price. How, in face of these figures, showing a falling off of upward of a million dollars, can the pool companies claim to be earning their fixed charges?

"This is as absurd as their statement that the Commercial has resorted to unfair means to obtain a greater share of the cable business than we are entitled to. The means by which we have obtained so great a share of the business—about one-third of it all—is by open and fair competition, giving the public the best service at a moderate price. As to having a greater share than we are entitled to, are we not entitled to all the business the public chooses to give us, or do the pool companies own the Atlantic Ocean?"

PARTZ ACID GRAVITY BATTERY.

The Partz Acid Gravity Battery.

We illustrate below the Partz acid gravity battery. In this new battery the gravity principle is applied to voltaic apparatus of the Bunsen type, in a way similar to that in which it has been applied by Meidinger and others to apparatus of the Daniell type.

When using an ordinary Bunsen or Poggendorff battery, in which carbon cathodes are depolarized by either nitric or chromic acid, one is obliged, in order to obtain full effect, to supply it with the normal quantity of acid, for however short a time it may be wanted; and unless it be taken apart after having done its work, the liquids, vertically separated by permeable partitions, will soon diffuse and material be wasted. On account of their saving the trouble of removing and emptying the porous clay cups, "dip-batteries" on Grenet's plan, variously modified, have become the favorite means of generating strong electric currents for temporary applications, though they are wasteful and their employment is limited to comparatively short periods.

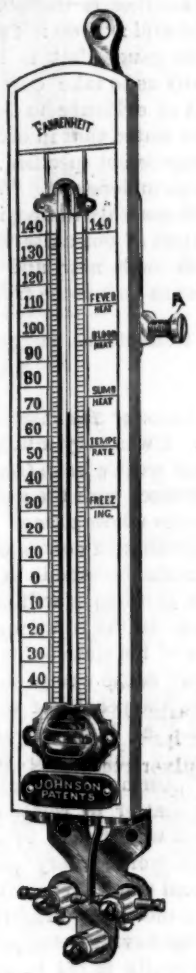
It is to avoid this frequent renewal and attendance that the "acid gravity battery" was designed. It is so arranged that the depolarizing material can be supplied without interrupting the action.

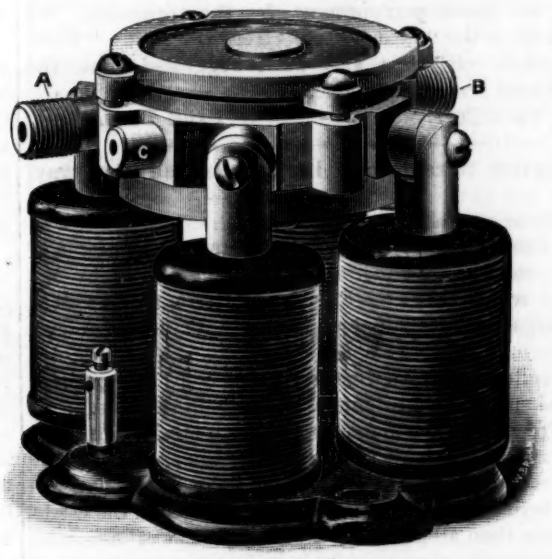
The cell which is shown in the accompanying engraving consists of a glass jar, upon the bottom of which rests the carbon electrode connected by a rod to the upper terminal. The zinc is suspended from the central rod, and at the right is a glass tube, funnel-shaped and open at the bottom. In mounting the battery the glass jar is filled just high enough to cover the zinc plate, with a solution of either an alkaline sulphate, preferably that of magnesia (1 part in 4 parts of water), or an alkaline chloride, preferably that of ammonium (1 part in 5 parts of water), each cell requiring about 45 fluid ounces. To these solutions may be added from 5 to 10 per cent. of hydrochloric acid, which lessens the internal resistance, but causes some local action on the zincs. The depolarization is effected by means of a "sulpho-chromic salt" made by the Partz Electric Battery Company, of Philadelphia. This salt, in which sulphuric acid has been caused to combine with chromic acid in an amorpho-crystalline state, is dropped into the glass tube, whereupon the carbon cathode soon becomes covered with a dense stratum of depolarizing liquid.

When the depolarizer becomes exhausted, a fresh supply of salt is dropped into the tube, thus continuing the action of the battery without interruption.

The E. M. F. of the battery is stated to be 1.95 volts, and its strength of current with different solutions varies from 3 to 7 ampères.

The battery is well adapted to operate light machinery, dental mallets and fans, or can be used for various electro-medical purposes, such as the cautery, etc. Though principally intended for this acid gravity battery, the "sulpho-chromic salt" contains the essential ingredients of an "electropoion fluid," and may also be used in preparing the customary solutions for Poggendorff and Grenet batteries.





FIGS. 1 AND 2.—ELECTRO-PNEUMATIC VALVE AND THERMOSTAT.

The Waterhouse System at Hartford, Conn.

The following appreciative notice of the Waterhouse electric light system appeared in the Hartford *Courant*, a leading New England journal, on July 23:

Hartford may well feel proud to number among its industries a corporation that has so complete a system of electric lighting, and we take pleasure in noting its successful operation on the streets of our city. The Waterhouse Electric and Manufacturing Company was incorporated by the Legislature at its last January session, has its factory at Colt's west armory, and its stockholders are a number of our successful manufacturers and business men. The officers of the company are: Asa S. Cook, President and Treasurer; S. W. Bishop, Vice-President; Chas. E. Chapin, Secretary; A. G. Waterhouse, electrician. The directors are: Asa S. Cook, S. W. Bishop, Francis A. Pratt, Charles E. Billings, A. G. Waterhouse, S. O. Prentice and George M. Bond. The company has a solid financial backing; five of its directors are mechanical experts, and, added to this, the Waterhouse system is considered by good judges "a decided advance in the art."

The Waterhouse arc system produces a brilliant, steady light, superior in every respect, and entirely suitable for out and indoor lighting; the latter especially on account of its steadiness. But while a steady light is a most important result, there are other equally important features in a system to readily attain what could be called advancement over what is in the field, viz., regulation of the current, simplicity and reliability of the lamp, and economy of power required to operate the system.

The Hartford Electric Light Company have held tenaciously to the system that they have been lighting the city with heretofore, believing it to be the best, and it does stand high; but they are anxious to furnish the best light in the world, and it was the prospect of improvement that led them to give the Waterhouse system a trial. At their station they now have two of the Waterhouse generators on a circuit of forty-five lights. These can be seen on the park and on Main street north of Mulberry. The ease, perfection and harmonious workings of the new system are apparent to those unfamiliar with the subject. Everything works together. The regulator keeps the current constant, the lamps have great feeding powers, the light is most brilliant and steady, and the power required is the wonder to the experts. It is admitted that a full arc light of the several great systems of our country requires about a horse-power to maintain it, and on two systems they take a horse-power and a quarter per light; but the average is about a horse-power. Now, the Waterhouse system figures practically less than half a horse-power per light, and the indications, taken direct from the engine, prove it so; while for penetrating distance they are up to standard, and the claim of the company, that their lights require but half a horse-power per light (full arc), is sustained. The Waterhouse system, complete in its details and fully covering the features so necessary for a perfect working system, has this great saving of power, which is an incontrovertible argument in its favor.

Electro-Pneumatic Valve and Thermostat.

One of the most ingenious methods of obtaining proper ventilation and maintaining a uniform temperature throughout large rooms and entire buildings is that by which the valves of the radiators are opened and closed by the aid of electricity. Such a system has been devised by Prof. W. L. Johnson, and its exploitation has been undertaken by the National Electric Service Co., of this city, with eminent success.

Instead of allowing electricity to perform the work of opening and closing the valves, which would require considerable battery power, the system is so arranged that the current merely operates a relay, as it were, which sets the real operating force in action. The valves constructed on this system have their spindles attached to flexible diaphragms, one side of which is connected to a reservoir of compressed air which is constantly kept supplied automatically. Now, whenever the thermostat closes the circuit upon a rise of temperature, the electro-pneumatic valve, shown in Fig. 1, is put in operation. This valve is fastened to the wall or floor, usually near the diaphragm valve. The nipple *A* is connected by a short tube to the pipe which leads to the reservoir of compressed air, usually located in the basement of the building. The same pipe leading from the reservoir runs to all of the electro-pneumatic valves. When the thermostat closes the circuit the electro-pneumatic valve operates, the compressed air passes freely through it from the nipple *A* to the nipple *B* on the opposite side, and so on to the diaphragm valve. When the electric circuit is again made, the electro-pneumatic valve closes the outlet to the compressed air reservoir and opens the outlet *C*. The diaphragm valve, being relieved from the pressure, opens again. The thermostat employed in connection with this ingenious system is shown in Fig. 2. The wires lead from the three binding posts at the bottom to the battery and the electro-pneumatic valve. By means of the screw *A*, seen at the side of the instrument, the thermostat is set at any desired temperature. When the apartment reaches this temperature the electric circuit is closed; the valve allows the compressed air to enter the diaphragm valve and shut off the steam, hot air, circulation of water or whatever is the source of heat. The temperature then begins to fall, but before it has fallen one degree the electric circuit is again made and the diaphragm valve opened. In this way uniform

temperature is maintained. From three to six open circuit cells are required, according to the number of valves to be operated. The system is coming into use all over the country, its progress having already furnished matter for several notes in these columns.

Opinion Regarding Electrical Conduit Material.

To the Editor of The Electrical World:

SIR: It is surprising that after all the investigations made by the Subway Commissioners—besides having the assistance of reputed experts—that they should commend for an underground substance a *mixture*, and not a *compound*.

Bitumen and silex will not coalesce, but will ever remain a mechanical mixture, and though of high resistance, will not be sufficiently high to prevent serious induction in contiguous wires. The true solution of the underground problem will be found in a substance forming a *chemical compound of crystalline structure*. Until that is found, all else will be makeshifts. Still, knowledge is gained in that way. F.

PHILADELPHIA.

The Case Heat Battery.

To the Editor of The Electrical World:

SIR: Since sending you Mr. W. E. Case's Royal Society paper on his "heat cell"—an abstract of which appears in your issue of July 24—Mr. Case has forwarded to me the results of some further investigations. The low E. M. F. (0.2607 volt) upon which you comment, was, you will notice, obtained with a cell containing elements of tin and platinum. Mr. Case has now substituted carbon for platinum, with the result of nearly doubling the E. M. F.; careful measurement of a cell in other respects unchanged showing an E. M. F. of .473 volt.

Both Mr. Case and myself anticipate you in the invention of the name you propose for the apparatus. We have called it the "heat battery" from the first. "Thermo-galvanic cell" has also been suggested, but the simpler term seems preferable.

NEW YORK CITY. PARK BENJAMIN.

The English Wire Gauge in France and Germany.

To the Editor of The Electrical World:

SIR: The interesting collection of letters in your issue of June 19, on the wire gauge question, is prefaced by the editorial remark that the French and Germans, as well as the English, have adopted the new British standard gauge.

This statement is so incorrect that you will perhaps allow me space to state some of the facts in the case.

The French and Germans are *not* using the British wire gauge, and there is no risk in making the prediction that they never will use it. They already have something infinitely better, and which is more widely used in the world of business than all gauges and other systems of measurement combined—measurement in millimetres and fractions thereof. This system is also used by scientific men everywhere, even including Great Britain and America.

The other part of the statement is also incorrect, for diligent inquiry has failed to discover that the English themselves have generally adopted the new gauge. They appear, on the whole, to oppose it, and to resent its enaction by the government as somewhat of an imposition.

In fact, to judge from the letters which you have printed, it looks as if the only people who have really adopted the new gauge—aside from that department of the British government called the Board of Trade—are the American Telephone Exchange and Electric Light Associations!

Having had some practical experience with the various systems of wire and sheet metal measurement, including divers gauges, "mils" and millimetres, I think that the inevitable conclusions of any one who passes through a similar experience will be about as follows:

1. That the best method of measurement is afforded by the metric system, which is in general use throughout the greater part of the civilized world.

2. That the next best method is afforded by the division of the inch into thousandths, or mils.

3. That if a gauge of some sort must be used, the only one worth considering—for Americans—is Brown & Sharpe's, or the American gauge, which is now in general use, and which is the only gauge based upon a scientific principle.

It is hardly to be expected that the metric system should find favor in America, as it is so little understood, but the method of indicating sizes in mils is simple, and offers the advantage of a quick and ready conversion into millimetres. The "adoption" of the British standard gauge by the two associations mentioned appears to have been without effect, and I agree with one of your correspondents who thinks that they "acted rather hastily" in the matter. I also agree with those who think that legislation to compel the use of the new gauge would be "ill-advised" and "futile." The probable result would be to add another confusing element to the situation.

Would it not be preferable to unite upon the adoption of "mils" with the B. & S. gauge as an alternative? If you wish to attain uniformity with the English, you will come much nearer to it by using mils than with the new gauge, for the steady tendency in Great Britain is toward the abandonment of gauges. F. R. WELLES.

BELL TELEPHONE MFG. CO., Antwerp, Belgium.

[As to the alleged inaccuracy of our statement regarding the use of the new English gauge by the French and the Germans, we can only say that Mr. Welles' testimony is in direct conflict with that of Mr. Sise, of Canada, Mr. Clark B. Hotchkiss and others very well informed on these matters. At the Providence Telephone Convention last year, Mr. Hotchkiss said: "I am informed of late that not only has the English government adopted the ordinary rule * * * * but that it has been since that time approved of and adopted by the German government, so that the Germans, the French and the English are now using one standard wire gauge." Mr. Sise said: "In Germany, where we get a great many cases, the German government has used exclusively the English standard gauge. * * * * In France they draw but little wire, as a general thing. Germany and England are furnishing practically all the wire on the continent; and there the only gauge in use, unless some person for a special object orders another, is the standard gauge of England." Mr. Sargent said: "I do not see why we may not just as well have the gauge that is in use in England, France and Germany as to take one of our own." There is plainly a conflict of evidence on that point. As to use in England, Mr. Sise stated that in ordering wire from England, when the gauge is not specified, the new Board of Trade gauge is always understood. We therefore regard our summing up as thoroughly in keeping with the evidence presented. The object of our agitation of the matter has been solely to elicit such new and very valuable statements and opinions as now come from Mr. Welles.—EDS. E. W.]

Some Reflections Suggested by the New Orleans Telephone Suit.

To the Editor of The Electrical World:

SIR: I was very much interested in reading a letter in your last week's issue from Francis E. Nipher. I have no acquaintance with the gentleman, nor do I know any of the parties whose names appear in his communication; but, as letters of correspondents, when published in public journals, become in a sense public property, I take it that the gentleman will not be offended if a few comments are made on the fundamental subject of his discussion.

Some of his statements are of a broad character, which naturally cause one to stop and ponder. He says: "The rights of the people of the United States were not represented at New Orleans, etc.," and he questions the singularity that "no scientific man was allowed to testify" during the progress of that case. I read all the subject-matter in relation to it which came in my way, and I too was struck, in the same manner, that the case had been worked very peculiarly on the part of the defense, and think there must have been a "nigger in the fence" somewhere. The rights of the people of the United States not having been properly represented in that case, one naturally is led to inquire, will they (the people) be better represented in the coming government suit? Will honest experts and scientific men be called to give testimony and show up facts there?

For my part, I never was in the telephone business except as an experimenter. I never saw a Reis instrument except as illustrated in books, but if to test the Reis instrument was to prove that two platinium electrodes when fixed in a transmitter will transmit articulate speech, I am prepared to say to that question, yes, they will.

At the present time I have in my house a transmitter in which I employ platinum electrodes, and through the whole resistance of a rheostat measuring eleven thousand ohms, I hear the ticking of a clock and get as loud talk as if I employed a carbon button and platinum point. To me the notion that "the compressibility of the carbon is cause of articulate speech in the Blake transmitter" is all nonsense. If any one will bury the electrodes of a Blake transmitter under water and talk to the diaphragm, he will find just about two minutes' talk in it, after which it will remain dumb as an oyster until the carbon is again brought to the action of free air, that it may again become charged with the occult gases for which it has an affinity.

In my judgment the breaking of contact between the electrodes of any transmitter through vibration has very little to do with the case, so long as there is some conducting medium to bridge the broken space. I would say that the heated gases between the points are made a partial conductor by the formation of a small arc, and that is the bridge over which the current is carried. It is well known that platinum, too, has a peculiar nature, and through atmospheric absorption is charged with gases. But, as Mr. Nipher says, "it is very easy to find men who can not do things which others can do." I know of no patent issued from our Patent Office on the subject of receivers which does not intimate in the specifications that the diaphragm moves. I sometimes like to differ with experts, if for no other reason than that of being contrary. My observations lead me to disbelieve such opinions, but, as opinion is the absence of fact, I too may be wrong when I say it does not move. But as Professor Bell and others who follow in his train have not proved that it does move, I in my turn am in no worse plight for proof of my opinion than they are to prove their assertion.

I say this: There is a molecular disturbance of the magnet core and diaphragm, and the magnetic field is a bridge-tie making them a unit when performing work.

At the present time I have an instrument which makes all the noises of a Bell receiver, and which has no sign of a diaphragm to it.

Now, another question: Is it an undulatory current which makes a telephone talk? Here again my perverse nature prompts me to differ from the multitude, even though they be venerable for gray hairs and clad in rich attire.

If we take two electro-magnets, each having a diaphragm for an armature, and place them in a battery circuit, making one the transmitter and the other the receiver, then the current passing over the line might, in a certain sense, be called undulatory. In this case the vibratory action of the diaphragm calls for a greater or less amount of work to be performed by the transmitter magnet, following which is a reciprocal response in the receiver; but even then it is a question if the current be undulatory, for the reason that there is a constant electromotive force and an unbroken circuit.

Now, as to the telephone that is in commercial use. Take a small electro-magnet, put it in the secondary circuit of an induction coil, and no force will be evinced in the magnet on making and breaking the primary circuit. Also, if a galvanometer be so placed, the needle will deflect one way when the primary is closed, and deflect the opposite way when broken. I would say that these facts indicated an alternating current.

To me these things are very, very funny, to say the least of them.

We are told that "all matter is in a continual state of vibration." Now, because our vision is not sharp enough to see it, is no proof that the electrode in a transmitter is exempt from this indisputable law. The general use to which an induction coil is put calls for a change of polarity, and I think there can be no doubt that a transmitter is the pole-changer of the present telephone in use. Of course, the intervals of space between the breaks are immeasurable, and if I am not mistaken I have read that Mr. Edison claims the air to be not only a conductor, but is susceptible to changes of polarity.

Now I begin to believe, as Mr. Nipher hints, that there is more profit for an alleged infringing telephone company to sell out to the Bell people than can be gained by them in running their business for the public benefit. However this may be, there is no question but that patents should be strictly upheld, and inventors are entitled to and should be justly sustained in any monopoly they may set up on the strength of their patent rights, whether it hurts or not; provided, however, the rights are obtained legally and they are the first discoverers of the processes or arts claimed by them. But in the present telephone business, there have loomed up questions of much importance to the American public, and the old, stereotyped question again arises, "What are you going to do about it?" A great suit is now pending. On one side is the government; on the other side, the Bell Telephone Company, to whom have been granted rights which up to this time the courts have declared are just. Perhaps these decisions would not have so been had there been a fair and thorough introduction of expert and scientific knowledge as testimony on the part of the defense, and every one of these cases won by the Bell people has given them additional strength of position; and influenced by fear, capital will not be apt to embark in a business which has a prospective lawsuit. Now, in the coming suit, who will force a presentation of evidence that will pronounce things for just what they are, though the heavens may fall? Are the Rogerses to do this? Not much; their axe has been ground to cut other timber. Is the National Improved Telephone Company to champion the people's case? Heaven forbid that they shall, if the New Orleans fiasco is a sample of their might. Who are they who shall insist that unprejudiced, unbiased and incorruptible electrical scientists and experts shall be examined to settle or not the question, whether for seven more years it shall be "Hello, Central!" at a price which is an outrage on an intelligent and suffering people? Of course I would like to hold just such a monopoly, and would cling to it like grim death to a nigger, but if I held the said tenure illegally and was oppressive, then I should be bounced. The patent laws were made for the public's benefit first, and the inventor must stand at the end of the line. Let us have justice. J. H. GUEST.

BROOKLYN, N. Y.

The Detroit Electric Light Convention.

The following letter, dated July 26, from Mr. J. F. Noonan, Chairman of the Committee on Transportation, to Mr. A. J. de Camp, Chairman of the Executive Committee of the National Electric Light Association, gives the latest information regarding rates:

"I have an approved rate from New York to Suspension Bridge and return for members of the Electric Light Association, of $13.90.

"On account of the delay of the Western Traffic Association, I cannot give rate from Suspension Bridge to Detroit until next week. In connection therewith the Wabash people will give a reduced rate from Detroit to St. Louis and return for such of our members as desire to attend the National Telephone Convention."

A New Cable from the United States to Brazil.

The Pedro Segundo American Telegraph and Cable Company is a corporation chartered under the laws of the State of New York, and is specially organized for the purpose of furnishing a direct cable between the United States, Venezuela and Brazil. Recognizing the great need of such a service, and desiring to encourage and aid the enterprise, the imperial government of Brazil and the Republic of Venezuela granted very favorable concessions to the company. His Majesty Dom Pedro Segundo, Emperor of Brazil, very graciously permitted the American company to use his name in its corporate title

The South American trade in this country will be greatly benefited by this system, as it will furnish direct communication instead of being wholly dependent upon the indirect lines via Europe, controlled by the cable pool companies.

When this enterprise was first started the tariff between this city and Rio de Janeiro was $2.91 per word. As soon as the success of this system was assured, the pool cables reduced from time to time their rates, until to-day the rate is $2.06 per word between New York and Rio. The company proposes, it says, to establish its rates much below those now fixed by the pool, and will be greatly aided by the government telegraph land lines of Brazil and of Venezuela, with which working traffic agreements have already been arranged.

Messages between this city and South America will, the company claims, be transmitted in less than one-fourth of the time required by the pool cables.

The government lines in Brazil are among the finest ever built. The wires are strung on iron posts, and the service is most reliable. The lines are inspected by linemen every twenty-four hours, and extend along the entire coast of Brazil, being to-day more than 10,292 kilometres in length, and connecting telegraphically all the cities of that country directly with this country and Europe. The land lines of Venezuela are also under government control and management, and form good connections between the principal cities of that Republic. Heretofore Venezuela has had no telegraphic connection with the world, except through messages sent by boats to the Island of Trinidad, and forwarded from this point over the West Indian system, at the enormous rate of $2.94 per word.

The executive offices of the Pedro Segundo American Telegraph and Cable Company are now located at Nos.

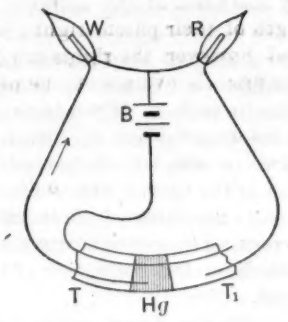


FIG. 2.—FIRE-DAMP INDICATOR.

44–46 Broadway, and the following gentlemen compose its officers and board of directors: H. K. Thurber, President; Edward R. Bacon, First Vice-President; Charles R. Flint, Treasurer; De Borden Wilmot, Secretary; Joseph Edward Simmons, Francis A. Bassler, Charles H. Sandford, John C. Redman and Henry W. Cannon.

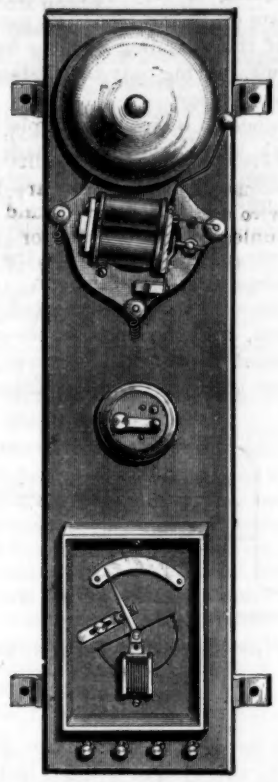
The cable will be altogether about 4,000 miles in length, and is to be made in France and England, the Henley works having a part of the contract. The southern end of the cable will begin at Viseu, on the coast of Brazil. Thence it will be laid to Cayenne, French Guiana, where it will touch, and then go on to the mouth of the Orinoco River. Here it will connect with some of the land lines in Venezuela. Thence the cable will follow the coast of Venezuela to the northern side, where it will again touch the shore, connecting with Caracas and other important cities and seaports in Venezuela. From Cura, Venezuela, the cable will go direct to Port au Prince, Hayti, an important port, which is now altogether without cable connections. Thence the cable will come in a straight line to New York, landing at this city. The company opened its offices at 44 and 46 Broadway, on the 20th inst., in the presence of His Royal Highness the Prince Dom Augusto; Dr. Da Costa, who represented the Brazilian Minister at Washington; Salvador de Mendonça, the Brazilian Consul-General; Commander Soldanha de Gama, of the Brazilian corvette, and other notables. The minister presented to the company a life-size portrait of old Emperor Dom Pedro, which was unveiled by the Prince, and there were speeches of courtesy and congratulation. Mr. Wilmot, of the law firm of Wilmot & Gage, counsel for the company, informs us that the line will, in all probability, be ready by the close of the year.

Insulator for Storage Batteries.—An improved form of insulator for supporting storage battery troughs has been lately introduced; the upper portion of the insulator on which the trough rests is larger in diameter than the base, being of mushroom form. Any drip, therefore, will fall clear of the lower part of the insulator, which would remain dry.

Alarm Indicator for Electric Light Stations.

One of the most simple current meters designed to be placed on arc light circuits is that recently devised by Mr. E. R. Knowles, electrician of the Brooklyn Electric Construction Company as an adjunct to its arc light system.

The indicator consists of a small coil within which swings a semi-circular core suspended on pivots and carrying a pointer. The semi-circular core is composed of two parts, viz., brass and iron, constructed to balance each other, so that when no current is passing the pointer



ALARM INDICATOR FOR ELECTRIC LIGHT STATIONS.

stands vertical. By the passage of the current the part consisting of iron is sucked into the solenoid and deflects the pointer a distance proportional to the strength of the current. When in the position indicating normal strength of current in the circuit the pointer is situated midway between two contact points in circuit with the bell and local battery. Hence any deviation in either direction from the normal current will cause the bell to ring and thus inform the attendant of the state of affairs. Mounted on the same board is a switch by which the local bell circuit can be broken. This prevents the continuous ringing of the bell when the dynamo is stopped.

An Electric Light Fire-Damp Indicator.

Probably the only objection to the use of incandescent lamps in mines was that recently pointed out in the report of the English Royal Commission on Accidents in Mines, which states that the use of the electric light in mines, notwithstanding its many great advantages, has a defect, in that the light of an incandescent lamp being produced within a vacuum cannot admit of any device for the indication of fire-damp, such as is employed in the Davy lamp, for example.

This objection has, however, been overcome in an apparatus which was recently exhibited before the Physical Society by its inventors, Messrs. Walter Emmott and William Ackroyd. The apparatus, which is shown in perspective in Fig. 1, consists of two incandescent lamps, one with white glass and the other with red, and other necessary adjuncts, such that in an ordinary atmosphere the white incandescent lamp alone shines, but in fire-damp the white lamp goes out and the red one begins to emit its light. This is effected as follows: A porous pot of unglazed hard baked porcelain is joined by air-tight connections to a tube, a portion of which is represented by *T T*, Fig. 2. This tube is of such an internal diameter that it will readily admit of being sealed with a small quantity of mercury, *Hg*. A platinum wire runs the whole length of

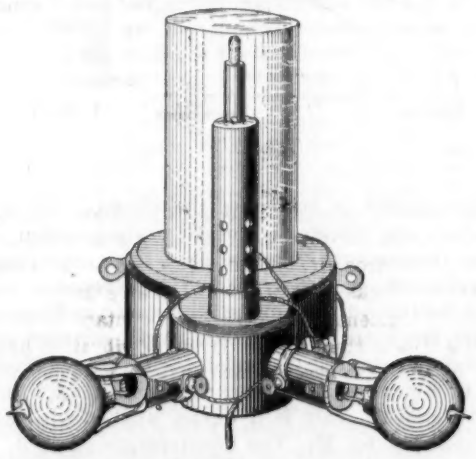


FIG. 1.—FIRE-DAMP INDICATOR.

the tube, and is connected with one of the poles of the battery *B*, or other source of electricity. Two other platinum wires in the tube run parallel with this for part of the way, as in Fig. 2, and each is connected with a lamp. The lamps *W* and *R* are joined, and a branch wire connects them to the other pole of the battery. In Fig. 2 the current is represented as flowing through *W*; when from diffusion in an atmosphere of fire-damp, the conducting plug *Hg* is driven up to *T*, the current will flow through *R*, and the red light may then be taken to indicate the presence of fire-damp. The wires being within the tube, one or other of the lamps must always be shining so long as there is a current, whether the apparatus be in an atmosphere of fire-damp, choke-damp or air; and to prevent the mercury being driven out of the tube by too much pressure, bulbs are arranged on either side, as in Fig. 3, which presents a diagrammatic view of the apparatus.

The inventors find an internal diameter of tubing of about 3 mm. best adapted for insuring easy mobility of the mercury. The presence of the wires within the tube has interfered with the perfection of the seal; this, however, has been overcome by the introduction of a little concentrated sulphuric acid, which also serves the purpose of preventing sparking and of lubricating the interior. The use of sulphuric acid necessitates the addition of desiccators *a* and *b*, Fig. 3, to each end of the tube, but in cases where it has been found advisable not to use sulphuric acid both the acid and the desiccators have been dispensed with by slightly modifying the arrangement of the wires at the lower part of the tube.

With this form of apparatus one can readily detect the presence of 5 per cent. of coal gas in a mixture of this gas with air, and with a mercury seal of less weight and closer proximity of the wires at *T* and *T*, Fig. 2, it appears possible to get any desired degree of sensitiveness.

The "Graphophone."

Some exhibitions have been given lately by Mr. Tainter of the graphophone, invented jointly by himself, Prof. Bell and Dr. Bell. It is one outcome of their researches in radiaphony and like fields as lately described in these columns. It is built upon the principle of Edison's ingenious phonograph. It is a machine about the size of a diminutive sausage mill having, instead of knives, a cylinder of solid brass about one and a half inches in diameter and six inches long, rapidly revolved by an arrangement of cogs connected with a wheel turned by hand, like the hand attachment of a sewing machine. Over this cylinder is placed a lightly fitting tube

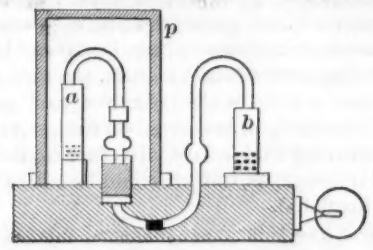


FIG. 3.—FIRE-DAMP INDICATOR.

of paraffine. An attachment with a fine metal point, to which is affixed a diaphragm and speaking tube, rests against the polished paraffine surface. By turning the wheel the cylinder revolves and the metal point is drawn along its surface, cutting a groove almost imperceptible to the eye. While the cylinder is revolving the operator speaks into the tube, and the waves of sound against the diaphragm regulate the pressure of the point against the paraffine. When through talking, the speaking tube or transmitter is replaced by an instrument known as a receiver, and it, being connected with the cylinder, reproduces the language originally spoken by the operator. The words are repeated loud enough to be heard distinctly in any part of a small room. The paraffine tubes, which cost about a cent apiece, take dictation of about five minutes, speaking at any chosen rate of speed. Not only is the language repeated, but the tone of voice as well. An automatic device to turn the cylinder is being perfected. The machine is arranged so that it can be stopped at will, any sentence or part of a sentence repeated and an indefinite number of copies made by an amanuensis of the words recorded upon the cylinder.

Combination of Cadmium and Iodine.

Mr. A. P. Laurie, in a paper before the Chemical Society on "The Electromotive Forces Developed during the Combination of Cadmium and Iodine in Presence of Water," says he has determined, by means of a Thomson electrometer, the electromotive forces of cells consisting of a cadmium and a platinum plate immersed in a solution of cadmium iodide containing free iodine. In one set of experiments, the amount of cadmium iodide in solution was constant and the amount of iodine was varied; in another the amount of cadmium iodide varied, the solution being in each case saturated with iodine; in a third, a constant amount of iodine, but varying amounts of cadmium iodide, were used. The result of the experiments is to show that, if cadmium and water containing cadmium iodide and free iodine are brought together, a considerable

electromotive force is developed, which steadily falls. This depends on the facts (1) that as the free iodine is diminished, the electromotive force falls gradually at first, but more rapidly the less iodine there is present; (2) that as the cadmium iodide solution increases in strength, the electromotive forces falls very rapidly, while very small quantities of the salt are present, but more and more slowly as the amount of salt present becomes considerable. In both cases the change may be represented by a continuous curve. The actual values are given in the paper.

The Telephone as a Receiving Instrument in Military Telegraphy.

In a paper read before the Society of Telegraph Engineers and Electricians recently, Capt. Philip Cardew, R. E., detailed a number of interesting experiments with the telephone in its use as a receiver for telegraphic signals. The system used resembles very much that employed by Mr. Phelps and Mr. Edison in their respective systems, in which the single clicks are broken up into a musical note by means of a vibrator in circuit.

The first instrument used was one by Messrs. Theiler, which consisted of a simple electro-magnet with an armature attached to a piece of German silver spring, fixed at both ends, and having a contact screw so arranged that when the armature was attracted the spring broke the circuit through the coils, as in the ordinary "trembler" or continuous ringing electric bell. The vibrating spring emitted a musical note, and the intermittent current it produced, when passed through a receiving telephone, emitted the same note, but in a louder degree—so loud, indeed, as to be distinctly heard in a large room. This note, broken up by the Morse signalling key, according to the Morse code, formed the message.

These sounders of Theiler were intended to be used as ordinary telegraph "sounders," but Captain Cardew states that they interfered with each other if more than two were used on one circuit. However, they proved serviceable along with the telephone in telegraphing on badly insulated military lines. For example, some 15 miles of bare wire, consisting of 10 miles of No. 15 B. W. G. soft iron galvanized wire and 5 miles of No. 16 B. W. G. copper wire, were laid along the ground beside the London, Chatham & Dover Railway line between New Brompton Station and Newington and back. The wire was laid in the hedges at some places to keep it out of the way of the traffic, and at other places it was picketed under stiles to prevent it from tripping people up. The ground was in general newly made, and the soil of fair conductivity. At crossings the wire was raised on poles, and this introduced induction signals, while the two different metals introduced earth currents. Notwithstanding all these adverse conditions, however, a current of ten Leclanché cells, with a Theiler sounder, gave distinct signals, the note produced being easily read in spite of the induction and earth current sounds. Signaling was carried on for several days by this method, proving that a bare wire, laid on the ground, would serve for messages, until it could be raised on poles and properly insulated.

The telephone has this great practical advantage, that it can be made very small and requires no adjustment. Moreover, it requires only a small battery to work it; and a pair of instruments can be used for speaking in the ordinary way, communicating orders and so on.

Fig. 1 shows the plan preferred by Captain Cardew for connecting up the sounder, key and telephone. By this arrangement, which will be easily understood from the figure, when it is observed that the vibrating reed or armature of the sounder interrupts the battery cicuit at each vibration, the results are that the sounder is practically uninfluenced by any change occurring in the line resistance. In the case of a dirty back contact in the key (a fault of frequent occurrence), continuity is still established through the coils of the Theiler sounder. Fewer cells are also required, four Leclanché cells being sufficient for ordinary circuits.

The telephones can, of course, be adapted to sit close to the ears, leaving the arms free. Even when the wire is bare and laid along the ground, the signals are still audible when the telephones are held to the ear. Everything considered, Captain Cardew recommends the combination of sounder, Morse key, and telephone as superior to the ordinary sounder for field service. The points of advantage are given by him as follows:

1. The possibility, as demonstrated, of working through a considerable length of bare wire.

2. The receiving instrument requiring no adjustment for altered conditions of line and different stations.

3. The reduction of the battery power necessary to be carried to, at most, one-fourth of the present requirements.

4. The continuity of the line being insured, independently of the back contact of the key.

5. The power of working through very bad earths, and saving much time in very dry places.

6. That the note signals are more easily read than the interval signals by men untrained to either.

According to Colonel Hamilton, R. E., who reported on some experiments made by the field telegraph corps at Aldershot with this system, a line of bare wire may be laid as fast as an army advances, and a party may follow at leisure and pole the line; the communication, however, being kept up from the first paying out of the line. After this report, extended trials of the system were made, and a number of converted sounders—that is to say, the old pattern field sounder converted into vibrating sounders, were sent out with the first Egyptian expedition in 1882, where they did good service in sending the messages from the field of Tel-el-Kebir. More than 115 messages were dispatched by them during the day from 8:30 A. M. to 6 P. M., each message averaging thirty words.

A new model of the sounder was subsequently designed. In it the noise of the vibrating armature is reduced to a minimum by making it very light, merely a piece of ferrotype iron plate or tinned iron. By means of a small key at the side of the signaling key, the home telephone is cut out of circuit, leaving only the distant telephone to be affected by the message.

To test the distance to which this simple harmonic telegraph would work, some trials were made in India, and messages were sent between Calicut and Tuticorin, a distance of 375 miles. Thirty Minotti cells were used at first, and the signals read while the telephone was held away from the ear. With four cells the message was heard with the telephone held to the ear.

One day the line wire was disconnected at Cochin, 125 miles from Calicut, and the ends of the wires thrown down on the wetted floor. Still, however, the messages passed, with four cells in circuit. These experiments

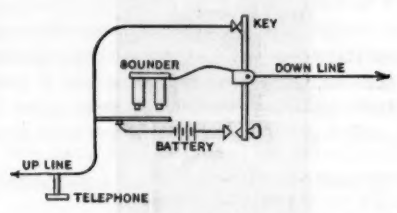


FIG. 1.—CIRCUIT OF MILITARY TELEPHONE—TELEGRAPH SERVICE.

showed that with an isolated aërial line great distances could be worked by this system without translation.

In 1883 the General Post-Office made experiments of various kinds with the system. They worked from New Cross to Chatham, a distance of thirty miles, with one cell and also through wet string and human bodies. In some parts of London the vibration currents were destroyed by induction on underground wires. In one experiment Captain Cardew joined two Morse circuits by the vibrator system, using condensers to break the communication between the two Morse circuits. The vibration signals were thus superposed on the Morse messages without interfering with them—a method originally proposed by Varley, and recently introduced by Mr. Van Ryssleberghe. The experiment was successful with the condensers, and also with a plate lightning protector, and a high resistance (10,000 ohms) in their stead.

Messages were also sent by the vibrator over the submarine cable between Dublin and Holyhead, a distance of 65 miles. It was found necessary, however, to stop the induced currents due to the other currents of the cable, which contains seven wires.

Captain Cardew appears to have noticed the effect of

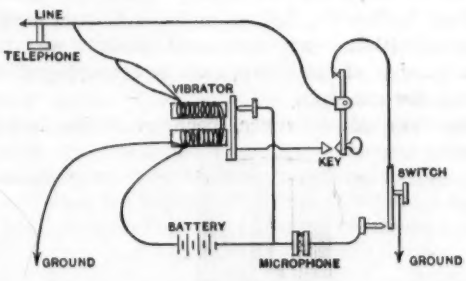


FIG. 2.

the electro magnet in softening the click of the Morse signals when the vibrator is worked in conjunction with the Morse instrument. For he says, in commenting on these experiments on Oct. 1, 1883, "The method is much improved by the addition of magnets on the Morse circuit, as the Morse clicks can be practically softened off in the telephone to such an extent, by being passed through the coils of a magnet, as to avoid all interference with the vibration signals." This is a device applied with much success recently by Mr. Van Ryssleberghe; but it was also tried successfully by Captain Cardew, who gave the name of "separator" to the condensers and electro-magnet coils. Some of these devices were sent out with the last Bechuanaland and Suakim expeditions. Mr. Van Ryselberghe, however, employs the telephone and microphone as speaking instruments, whereas Captain Cardew employed the more powerful vibration currents of the harmonic sounder.

The "separators" of Captain Cardew were not used in Bechuanaland or in the Soudan, but working was carried on for six weeks through a bare wire laid on the ground between Kaibar and Abu Fatmeh, and absolutely buried for 200 yards through the camp at Kaibar. Two small Leclanché cells were used at either end, yet kept up through a line making dead earth all the way, the call signal being heard without holding the telephone to the ear. It is to be remarked, however, that the ground in the Soudan is very dry.

The vibration system is now used by Captain Cardew in several ways. For example, with ordinary telephones a buzzing armature is fixed to the induction coil, which causes a vibratory current in the primary circuit, serving as a musical call instead of the ordinary call-bell. He has also adopted it for testing lightning rods.

Instead of the old Theiler vibrator, however, an improved pattern, worked on a primary low resistance coil, with a secondary coil to throw an alternating current on the line, has been introduced. With this three cells give as loud a note as ten cells with the present pattern under like conditions.

The latest form of the vibratory apparatus is called the "combination box," and goes into a leather pack together with the battery. Fig. 2 shows the connections of the instruments, the microphone being a "Hunnings" or "Moseley," arranged in a handy case with a switch on the handle, which, wheen squeezed in the hand, completes the circuit through the microphone and primary coil of the vibrator. Speech can then be exchanged, as will be seen by following out the connections. When listening, this pressure on the switch is relaxed, the battery circuit broken, and the secondary coil short-circuited. Thus the battery circuit is never kept on longer than is absolutely necessary—a most important point in the field, where small patterns of cells must be used, and renewals may not be at hand. The figure shows the vibrator with its double winding, capable of acting as an induction coil for speaking and as a vibrator.

Demonstration of the Electrical Residue.

Dr. Fr. Stenger, in Wiedemann's *Annalen*, according to the *Phil. Mag.*, says: "If two strips of tinfoil are fastened at a suitable distance on a glass tube which has been evacuated as completely as possible, and are connected with the electrodes of an induction coil, continuous electrical currents are formed in the interior, and the gas becomes intensely luminous. If, then, the two tinfoil rings are insulated, the tube becomes luminous at frequent intervals, and often for several minutes together. This doubtless arises from the formation of a residue on the sides of the glass. The experiment was made in a far more striking manner as follows: In a glass tube, about 2 centim. in the clear, closed at one end, a thin metal foil was introduced, so that it covered about half the inner side. A wire soldered to this plate was hermetically sealed in the tube, and was provided on the outside with a small knob. Opposite the metal cylinder a strip of tinfoil was fastened. This small Leyden jar was then rarefied as completely as possible, and hermetically sealed. If this was charged from a small electrical machine for ten or fifteen minutes the residual electricities could be discharged, producing a bright illumination in the tube. This method of rendering visible very small quantities of electricity might possibly be used in repeating in another form the experiments of Roland and Nichols, on the formation of the residue in quartz and calc-spar.

The Montgomery, Ala., Electric Street Railway.

The following letter is self-explanatory, and will be found very interesting:

MR. E. B. JOSEPH, *President*,
MR. J. A. GABOURY, *General Manager*,
Capital City Electric Street Railway,
MONTGOMERY, Ala., July 16, 1886.

DEAR SIR: Having received a great number of letters inquiring about the electric railway system, which we have been using on our street cars in Montgomery, I make the following statement, which probably will answer the questions you ask:

We contracted with the Van Depoele Manufacturing Company of Chicago to run two cars upon our Court street line, a distance of a mile and a half, under the Van Depoele system, with the agreement that should we be satisfied with the system, we would adopt it upon all our line.

The system used for conductor is an overhead wire with a traveling carrier, which passes along on the wire, the electricity being conveyed to the motor on the car by a cable suspended from the traveler; the return circuit being made through the rails of the track back to the generator. The generator is run by an ordinary common slide-valve engine; cylinder ten inches; 16-inch stroke; revolutions per minute 195; run with eighty (80) pounds steam pressure.

The weight of the cars is 3,500 pounds, and of the motor 700 pounds. The grade for the largest distance over the road was very heavy, running as high as 7 per cent.

We carried as many as forty people on these cars, and the cars were stopped and started going up grades to take on passengers without the least trouble.

We have made arrangements to put in an engine and boiler of sufficient capacity to run four lines, and are very well satisfied that it will be a great economy over running cars with mules or horses.

Any other information you may require upon this subject you can get by communicating directly with the Van Depoele Electric Manufacturing Company, 15 North Clinton street, Chicago. Yours truly,

[Signed.] C. C. ELECTRIC STREET RAILWAY,
J. T. ROBERTS, Secretary.

Researches Upon the Self-Induction of an Electric Current.

BY PROF. D. E. HUGHES, F. R. S.

(*Continued.*)

INFLUENCE OF A MAGNETIC SHEATH.

The remarkable phenomenon wherein a non-magnetic metal such as copper shows a higher "variable" resistance when under the influence of an external coating of iron than a wire of solid iron (and this notwithstanding that the resistance of the side of the bridge is kept a constant or by balancing its resistance on the opposite side, *G D*, as mentioned) seemed worthy of experimental research.

Experiments were made in order to find what form of conductor would give the maximum increased resistance in the variable period, and I found that an external tube of iron insulated from its central core produced this effect, for if the tube was not insulated but joined in electrical contact the results were reduced, due, I believe, to a transversal neutralization taking place in its own portion of the wire, as I have mentioned in my reply to the discussion on my first paper.

TABLE III.

Influence of an Iron Tube upon an Interior Insulated Wire.

Iron gas tube, 90 cm. in length, 10 cm diameter, 2 mm. thick; wires 1 mecre in length, 3 mm. diameter.	Comparative force of the extra currents.	Resistance in ohms, stable period.	Resistance in ohms, variable period.	Percentage of increased resistance in variable period.	Absolute increase of resistance in ohms.
Copper wire alone.....	82	0.00460	0 00482	7	0.00022
Copper wire insulated in the interior of the iron gas tube.....	410	0.00460	0.03220	600	0.02760
Brass wire, ditto	410	0.01380	0.03974	188	0.02594
Iron wire, ditto..... ..	615	0.02944	0.05888	100	0.02914
Lead wire, ditto.....	410	0.05750	0 08682	51	0.02932
German silver wire, ditto.....	410	0.07636	0.10384	36	0.02748

Table III. shows the effect produced upon an electric conductor by surrounding it with an insulated sheath of iron. It will be seen that the magnetic reaction of the tube upon the primary current passing in the wire produces a marked effect upon the different metals; the force of the extra currents as measured by the induction balance rises in value from 82 to 410, this being a constant for all metals except iron, which alone shows the higher force of 615. The force of the extra currents, however, has no direct relation to the extra resistance shown in the variable period, but the latter must be in direct relation with the duration or length of time required to pass from an infinite to the stable resistance.

The table shows on comparing the resistance of a metal in its stable period with that found in the variable, that copper has the highest percentage of increased resistance, being 600 per cent. increase, or seven times that found for its stable resistance, each metal in the order of their specific resistance having a less percentage of increased resistance until we arrive at the German silver wire, which shows only 36 per cent. against the 600 per cent. of the copper; we have also here the remarkable fact that iron even with a circular section stands simply in its order of specific resistance, showing only one sixth of the increased resistance experienced by copper; the percentage of increased resistance of a metal when under the influence of an insulated magnetic sheath, is directly as its conductivity or inversely as its specific resistance.

If we regard the phenomenon from a different point of view, confining ourselves simply to the additional resistance above that of its specific stable resistance, all metals whether magnetic or non-magnetic have an almost invariable quantity dependent entirely upon the co-efficient of the electro-magnetic action of the iron tube, and independent of the resistance or nature of the wire.

The experiments with an insulated iron sheath may be considered as a forced condition which does not occur or need not be taken into account, but the reaction of the iron tube is evidently electro-magnetic, and as our atmosphere is also magnetic, we may assume that its reaction would be similar, though in a far less degree to that which I have shown.

SUBMARINE CABLES.

The influence of a magnetic sheath upon an external insulated wire is one of vast practical importance in relation to our electrical submarine cables, as they are all constructed with an insulated wire surrounded by a spiral sheath of exterior iron wires. In order to study this question I made several cables of short lengths (1 meter) and found (most fortunately for our practical applications) that when the exterior iron sheath is divided as in a cable, or when the sheath consists of several large wires in close contact, that its effects are reduced to a mere fraction of what it would be if the external sheath was a continuous tube; this is entirely due (as I have shown in the case of stranded wires as compared with solid) to the imperfect formation of circular magnetism. I will cite a few examples illustrating this.

A cable was formed of a similar copper wire and insulation to that shown in Table III., the iron tube being replaced by eight iron wires (of 2 mm. diameter each) wound with a slight spiral of five turns per metre; this showed but 100 per cent. increase in the force of the extra currents against 400 per cent. increase when the same wire was in the iron tube; the increased resistance in the variable period was but 50 per cent., against 600 per cent for the iron tube, or only one-twelfth of the additional resistance caused by the tube. These wires were replaced by galvanized iron wire, which prevented magnetic contact, and the variable resistance became much less, and when these were replaced by numerous fine iron wires the effect was reduced to the minimum found, or only 20 per cent. increased resistance in the variable period, or thirty times less than that of a solid iron tube of much less iron.

It is therefore evident that the circular magnetism plays an important *rôle*, and that most fortunately our cable manufacturers (without knowing the immense reaction which would be produced by a continuous sheath of iron) have constructed our cables with a protection of iron divided into several iron wires instead of a continuous iron sheath; there are, however, many telegraph lines which, in passing through tunnels, use a continuous iron tube as the protection, and therefore such lines must feel all the deleterious effects that I have shown to be caused by the reaction of circular magnetism.

(TO BE CONCLUDED.)

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, July 26, 1886.

The Standard Underground Cable Company has just completed the laying of three of its five-conductor lead-covered cables of the Waring type for the Commercial Cable Company, and the wires are now being put in circuit. These cables are laid in a wooden box filled with bitumen, and extend from Nineteenth street to Ninety-third street on Second avenue, in this city. The old imported cables had deteriorated to such an extent under the influence of the water gas escaping from the pipes, that their replacement became absolutely necessary. The work was carried out under Mr. G. L. Wiley's supervision.

The Daft Electric Light Company has delivered to the Safety Electric Power Co., of New York, a thirty h. p. dynamo and a complement of "receivers" or motors, which are now running at the Sea Beach Exhibition, Coney Island. The receivers are used to operate the machinery and other apparatus of the exhibitors.

The Daft Electric Light Company is now fitting two Brill cars and two dummies with motors for a two-mile road at Los Angeles, California. It intends shipping the generator the first of next week. The expert will leave this week to place the overhead conductor which is to be used, and get everything ready for an early start. The managers of the Los Angeles road guarantee that whichever works the most economically, the dummies or the independent motors on the cars, will be adopted for their roads. The order for the four motors above mentioned is a bona fide commercial order, the Daft Company wisely refusing to experiment, claiming that it is ready to equip any road or roads with electric motors either by means of the overhead, subterranean or surface conductor.

The Worcester, Mass., Electric Power Company is rapidly adding to its plant to supply many of the large and well-known manufacturers of the town. The Daft system is used there.

The Electric Power Company of New York, operating a large system of transmission of electric power under the Daft system, is also constantly adding to its plant. Many of the elevators, printing presses, shafting lathes and ventilating fans situated below Chambers street are operated by this company. The manner of starting, stopping and regulating is complete in every detail.

From all I can ascertain, there is a great amount of experimental work going on in almost every department of electricity, and the feature of all this work is that the tests and trials are made with a greater closeness of observation and precision of result than ever before. Hence has arisen a new demand for test instruments. But test instruments can themselves sometimes, if badly made, be the most misleading of guides, and I think, therefore, that every tester and experimentalist should see to it that his instruments are right. He is helped to this end in buying the product of leading and responsible houses, and it is only natural that he should prefer reliable instruments to any others. He is safe, for example, if he takes Ayrton & Perry's ammeters and voltmeters, Elliott Brothers' standard galvanometers and test instruments, and other appliances of similar nature and repute. The Electrical Supply Company, agents for these goods, now keeps a stock at both depots, in New York and Chicago, and from its long experience can be relied upon for the best advice in these matters. The making and selling of electrical instruments is not a business born of a day, but requires a lifetime of devotion and enthusiasm, together with the possession of special information to be gained only by the closest study of a growing science. I do not say too much when I affirm that the company has fairly won its high standing by long and close familiarity with electricity in all its departments and by a determination to place only the finest instruments in the market.

The Electrical Supply Company has, moreover, lately given its attention to a new and promising field. I learn from Mr. H. P. Hungerford, the manager, that it has added to its present business in electrical goods, a branch for housework, and is now ready to furnish estimates for fitting up private houses, offices, stores, flats, hotels, tenements, etc., with electrical apparatus of every description, not forgetting electric gas lighting. As the company manufactures this line of goods, its facilities in the new departure are extensive, and will enable it to guarantee satisfactory results on any contract. The company has now several orders in hand, and is actively employed filling them.

The Brush-Swan Electric Light Company, of New England, with offices at 204-6-8-10 Elizabeth street, this city, has just issued a very tasteful pamphlet circular giving details of the system and testimonials from users of it. One letter is from the Willimantic Linen Company, which has been using Brush arc lamps since 1879, and Swan incandescent lamps for some time, and is pronounced in favor of both. The Low art tile people in Boston "scarcely feel that they could run their works during the winter months" without the Swan light. Altogether some thirty encomiums are printed. The circular closes with a list of nearly forty first-class steamers fitted with the Swan lamp.

The Shipman Engine Export Company is owner of the foreign patents for the Shipman automatic petroleum-burning steam engine, and should find a good business in the foreign electric lighting field. It has a number of good firms as sole agents, including the China and Japan Trading Company, for China and Japan; Henry W. Peabody & Co., for Australasia; Iasigi & Co. and Jacob Balladur & Co., for Turkey in Asia; W. R. Grace & Co., for Chili and Peru; M. Lanus and J. H. Snyder, for the Argentine Confederation and Uruguay, and E. W. Adams & Co., for the East and West Indies, the Mediterranean, India, Brazil and Guiana.

The Dickson Manufacturing Company, of 112 Liberty street, bought the right some time since to manufacture the Zell boiler, which has acquired an excellent name among electric lighting companies, and Mr. Zell can now be seen at the New York offices of the company, where all information relative to the boiler will be cheerfully given.

D. Frisbie & Co. have lately moved to this section from Philadelphia, where they had built up quite an extensive business in cut-off couplings, patent safety elevators, hoisting engines and in their specialty, friction clutch pulleys. This pulley or clutch runs loose on shaft, so that power can be transmitted at any desired speed and amount, allowing the engine or shaft to run at its full capacity at all times, if desired. The strong, massive arms on one side, and bolts on the other side of the pulley-ring, are brought in such positive contact with ring by a few pounds of pressure on clutch lever, as to make the pulley as effective as if keyed to the shaft. This is the only pulley in the market on which there is no lubricator used on friction surfaces, and the only one on which dependence can be placed for heavy work. The offices of the firm are now at 112 Liberty street, where they are doing a brisk business.

Mr. John S. Hall, of 40 Cortlandt street, is inclined to think that he has a good thing in oil cups for dynamos, seeing that Mr. Charles Batchelor, of the Edison Company, says in a letter to him: "During the last five years we have tried a great many different oil cups in the market and have found yours to give us satisfaction in every way." The Hall cups are to be seen on a great many dynamos at the present time.

A decided novelty is the new balance valve made by the Balance Valve and Steam Piston Packing Company, 280 Broadway. The valve consists of a solid casting open on the face side, which contains three openings, one for each end of a cylinder and one in the centre for the exhaust. The two discs of brass on the valve-rod, which opens and closes the ports where the steam enters each side, are kept balanced between the two ports into the steam chest by the exhaust steam acting against them. It is the most perfect automatic action ever placed before my eyes. The piston packing of this company has a very large sale and both of its specialties should meet with an extended sale among electric light stations.

Stout, Meadowcroft & Co., Fulton and Gold streets, have a new open circuit battery that can be carried in the vest pocket. The elements are dry throughout, the electrodes being carbon and zinc, and the carbon constituting the jar. The battery can be renewed for fifteen cents, and it is very handy for experimenters, telegraph and telephone inspectors and others. It meets a long-felt want, and its applications are very numerous. The size is 1 inch diameter and 3 inches height.

A recent tour in Brooklyn took me into the offices of Tucker & Baxter, 40 Fulton street, next the *Eagle* office, a most convenient location. The firm combines art, money and brains very effectively, and is turning out all conceivable kinds of electrical metal and wood work from its large factory. It has established several agencies for its goods here and in other cities. It makes in any quantity burglar alarms, annunciator cases, battery boxes, bell cases, telegraph, telephone and electric light woodwork, bells, automatic temperature regulators, and a great variety of other supplies.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Mass., July 26, 1886.

At a meeting of the board of Aldermen of Waltham, Mass, on the 19th instant, permission was given the Waltham Electric Light Company to erect poles and run wires through the streets of that city.

The Salem Electric Light Company has nearly finished locating its poles for lighting the streets of that city with electric arc lamps, as per contract recently awarded by the authorities. On the 19th instant eleven, out of a total number of 101 lights to be used, were started up, and it is assumed that the others will be ready for use within a week or ten days.

The reorganization of the Sun Electric Light Company of Woburn, Mass., was completed July 22. The name of the company was changed to "The Sun Electric Company." The following officers were elected: President, William Butterfield; manager and treasurer, Frederick Swift; secretary, Lyman P. French; and electrician, Marmaduke M. M. Slattery; directors, all of the above named gentlemen, and Isaac Fenno, N. J. Simonds and F. A. Gilbert.

The new central electric light station of the Edison Electric and Illuminating Company, of Boston, is being pushed to the limits of its present lighting capacity; that is, thirty-two hundred incandescent lights. Contracts are in hand for nearly five hundred additional lights, which will be furnished early in August. This station has been running continuously since May 17, and it is said that during that time the current has never been off the wires, nor a customer without electric light. The Sprague Electric Railway and Motor Company (with offices in this station), has twelve motors now running and reports a large number of orders in hand.

The Municipal Signal Company's police telegraph and telephone system recently placed in operation in South Boston has worked satisfactorily from the day of its installation. Arrangements are about to be made to equip other Boston police precincts with the same system. Prominent officials of Jersey City, and from other sections, have been in Boston during the past week for the

sole object of inspecting the system referred to, with the view of recommending its adoption in their respective cities.

At the annual meeting of the New Haven Electric Light Company, on Tuesday, July 20, it was voted to increase the capital stock from $100,000 to $150,000. The lighting capacity of the company's plant will be increased at once.

At Beverly, Mass., the demand upon the electric light company—recently organized there—for arc lights is far more encouraging than had been anticipated. A large number of the business men have contracted for commercial lights, which, together with the lights for the streets ordered by the authorities, will make a handsome showing for the new enterprise.

The Brush Electric Light Company of Boston reports a continued increase of orders for arc lights of its system, both for city and commercial lighting. The number of arc lights in actual use on July 15 is reported at 750, which will probably be increased to over 900 before October 1. At the company's magnificent station on Ferdinand street near the Providence R. R. depot, 21 dynamos and 6 steam engines are in use; five of the latter are of the Armington & Sims make, of 175 h. p. each, and one is a Fitchburg, of 75 h. p. In a few weeks a new 250 h. p. steam engine, two new boilers and several dynamos will be added to the present equipment of the plant.

The Worcester Electric Light Company is to-day one of the most prosperous enterprises of the kind in New England. On July 1 it had 239 arc lights in actual use, and before August 1 the lighting capacity of the plant will be increased to 279 arc lights, 112 of which are for street lighting. The company has ten Thomson-Houston dynamos, each capable of running thirty 2,000 c. p. arc lights, and the motive power consists of five Armington & Sims engines and one Putnam engine. The boilers used are four in number, and are from the works of Wm. Allen & Sons. Some months ago this company had Messrs. Walls & Co., of Worcester, make an iron structure for suspending an arc lamp over the middle of the street. After a long trial of this structure it was acknowledged to be an indispensable and invaluable adjunct to any system of electric street lighting, and the company ordered ten more.

These were finished and erected in May, and have since then given unbounded satisfaction to the people of Worcester; and the company has ordered made another ten—making in all 21 structures. These structures were referred to briefly by Mr. H. H. Fairbanks in his open letter to Mr. Frank Ridlon, published in THE ELECTRICAL WORLD.

The New England Telephone directors will meet on Friday (30th) to decide upon a dividend.

On Saturday (24th) a dispatch was received from Lowell, stating "that the Erie Telephone and Telegraph Company's quarterly dividend is paid out of its earnings for quarter ending June 30, passes to its reserve account $12,000 and adds to its system 200 new subscribers, the cost of all construction being taken from the earnings. The cost of adding 200 new subscribers is about $10,000, which would make net quarterly earnings, exclusive of cost of construction, $46,000, or $36,000, after paying construction. Erie is entirely out of debt and has a handsome surplus."

A special dated Portland, Me., July 25, says: "Thomas O'Reilly, of New York, is here for the purpose of organizing an assembly in Portland. A meeting this evening at the Preble House was largely attended by the telegraphers of this city. Mr. O'Reilly addressed the meeting, and an assembly was formed, which includes every operator in the city."

Under date of July 24, a dispatch from Ottawa, Ont., gives the following account of the new cable connection: The Canadian Pacific Railway has concluded arrangements with the Mackay-Bennett Commercial Cable Company for cable connections with its commercial telegraph system. Negotiations are also now on foot between it and the Baltimore & Ohio for connection with the latter's system. Dr. Norvin Green of the Western Union has been in Montreal for the last few days endeavoring to balk the negotiations, with a view of forcing the Canadian Pacific people to take over the Western Union's lease of the Great Northwestern Telegraph Company. He failed in this and left for New York. The Canadian Pacific will make its connection with the Mackay-Bennett cables next month.

On Thursday afternoon, July 15, a successful and highly satisfactory exhibition of a new automatic electric signal was given on the Fitchburg Railroad. Two cars equipped with the signal and carrying a party of railroad and newspaper men made a short run out on the Watertown Branch, where the workings of this new signaling apparatus were seen to good advantage. The device, which is automatic in construction and operation, enables trains to dispense entirely with the bell cord. The conductor can signal the engineer by means with which each car of the train is provided, and which do not require to be provided with separate couplings between adjacent cars. This is accomplished by utilizing the couplings of the various automatic air brakes and their connections, so that no additional labor is required to make electrical connection throughout the train, as the circuit is instantaneously and automatically completed by coupling the air brakes together. Further describing the invention, the electrical current is produced by six Leclanché batteries, which are hermetically sealed and placed in a suitable box, which is carried on the train, thence connected with the bell in the cab. This device has been examined by a large number of the leading railroad managers of New England, who pronounce it practical and of great value, and prophesy its universal adoption. It is now in use and can be seen in operation on the Fitchburg Railroad. The officers of the company are Charles H. Magoon, President; George D. Burton, Secretary and Treasurer; Directors, John H. Fox, East Jaffrey, N. H.; Charles H. Magoon, St. Johnsbury, Vt.; Luther E. Lewis, Boston; Murry V. Livingstone, Boston; J. T. Wilson, Boston; George D. Burton, New Ipswich, N. H.; Counsel, H. G. Corning, Boston, Mass.; Charles E. Barber, Washington.

The Bridgeport Brass Co. will erect at an early day a new wire and tube mill adjoining their present buildings. It will be of brick, 40×200 feet, and three stories in height.

The plant of the Harvey Screw and Bolt Company, of New York City, has been purchased by the American Screw Company, of Providence. The purchase includes the entire property, with all privileges and rights. The American Screw Company thus acquires the exclusive control for this continent of new and important processes for the manufacture of screws.

W. I. B.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, July 24, 1886.

The Hub friction clutch, advertised in your columns by the Link Belt Machine Company, 13-17 South Jefferson street, Chicago, possesses a feature not found in friction clutches generally, and I am not sure that it is found in any other clutch on the market. This feature is that the clutch runs in oil when idle, thus preventing a sudden throwing in of power, for the clutch must slip until the oil is expelled from the clutching surface, and not until then can it become perfectly rigid. Electric light men especially will appreciate this valuable feature in its use in connection with dynamos, which must be started gradually. The Link Belt Machinery Company will be glad to send their circulars and prices to those desiring them.

The Western Electric Company have just received an order for a 25-light machine for Junction City, Kan.; another order for a second 25-light machine for Alliance, O., and have just sent the third 25-light machine to Zanesville, O. The above are all arc light orders.

The following, from a local paper, refers to the Western Electric Company's plant at Visalia, Cal., which was started up July 4th: "The electric lights were a perfect success in every way, and the public verdict was unanimous in their favor. There were lights on the corner of Main and Court and Main and Church streets, and the Skating Rink and Good Templars' pavilion were also brilliantly illuminated by electricity. Judging by Visalia's first experience with electricity, there can scarcely be a doubt that the enterprising gentlemen to whom the city owes the attraction will meet with deserved financial success." The same paper relates that one of the mountaineers, who came into the city to celebrate the Fourth, and to see the new illuminant for the first time, wanted to know how much the electric light cost *per gallon*.

I was recently shown a large number of clippings from local newspapers referring to Western Electric plants. They are furnishing a light which seems to be giving satisfaction in every case.

The Western Electric Company have recently received a nice underground cable order from the Telephone Company at Detroit.

The Indianapolis *News* is very enthusiastic over its new incandescent electric lighting plant, recently installed by the Jenney Electric Company, of the same city. The *News* is the only paper in the city using electric lights, and claims to be the first paper in Indiana to illuminate its building throughout with electricity, for which commendable enterprise it deserves praise. In speaking of its plant, the paper says:

"In the *News* building there are now more than one hundred electric lamps, furnishing a bright, steady light, which may be shut off or turned on just as gas is, but which requires no matches to start it, and is accompanied by no noise, smoke, dirt or any considerable degree of heat. There is absolutely no danger from its use, and the substitution of it for gas or oil materially lessens the risks from fire or explosion. At the main entrance, over every desk in the counting room and the editorial department, over every case and stand in the composing room, in the press, stereotyping and mailing rooms and hallways, and suspended from every gas fixture in the building, are these little globular lamps, which look more like crystal ornaments than anything else, and are a source of endless amazement and suprise on the part of those who are for the first time let into the mysteries of electric lighting. They are either fastened to the walls or fixtures, or are suspended from the ceiling by wires—never in the way and always ready for use. By simply turning a key, a wide-spreading stream of light is thrown over surrounding objects, and it is of such a quality as not to tire or weaken the eyes.

"To go more into details, the Jenney incandescent light, which is the one used by the *News*, and which has various advantages over the others, is diffused through one lamp of 150 candle-power and 102 lamps of 16 candle-power each. It is generated by a dynamo in the basement, the power being furnished by a small engine manufactured expressly for the purpose, but which receives its steam supply from the larger boiler used in running the presses and furnishing heat. Every part of the building is "wired" throughout, and the lights are just as brilliant and steady on the top floor as they are in the basement. Although the *News* office has less use for artificial light than many establishments, on account of the daylight hours of labor, yet those connected with it already recognize the convenience and perfection of the incandescent system of lighting, and would very unwillingly return to gas. The workmen in the press room as well as the mighty intellects who flit about the editorial rooms, the printers and all, are equally complimentary in their views of it."

Probably there is not a house in the United States which has better facilities than those possessed by Mr. J. N. Raymond, of Chicago, for manufacturing lead and composition pipe for electric light, telephone and telegraph cables. Mr. Raymond's establishment is a large one, and it is fully equipped for turning out pipe of the most difficult specifications. Mr. Raymond has furnished a large amount of pipe for the Patterson cables, and companies requiring lead pipe for cable use cannot do better than give him their orders.

The Bell Company has sued the American Cushman Company for infringement.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes the following telephone stock quotations:

Bell of Mo.	$147@$150
Central Union	44@ 46
Chicago	365@ 375
Colorado	20@ 22
Cumberland	65@ 70
Great Southern	30@ 32
Iowa Union	15@ 18
Michigan	64@ 66
Mo. & Kan.	55@ 57
Mo. & Kan. Scrip, 55 cents on the dollar.	
Rocky Mountain Bell	40@ 45
United	15@ 18
Wisconsin	103@ 105

The Municipal Electric Lighting and Construction Company, of Minneapolis, Minn., have just received an order for an Edison plant of 50 lights to go in the grocery store of Andrew Shock, St. Paul. They have also obtained the contract for wiring the entire Travis block, a large six-story building on North Fourth street, Minneapolis. Fifty Edison lights will go at once into the J. F. Travis bookbindery and paper warehouse; the contract for wiring the Cushman building, on Washington avenue, south, has just been obtained by them, as well as the order for putting in the electric work in the Kelley block of residences on Hawthorne avenue, Minneapolis. Messrs. Sheldon and Huey are evidently up and doing.

W. A. K.

THE TELEGRAPH.

The Western Telegraph Company of Oberlin, has a capital stock of $15,000. Mr. James A. Sheridan is one of the incorporators.

A Fatal Fall.—Mr. W. V. Newkirk, a young operator employed on the New York Elevated Railroad, fell from the track while crossing last week, and died a few minutes after he had been carried to the hospital.

The Typo-Telegraph.—This new invention is now being tried by the French Minister des Postes et des Télégraphes, to whom it has been submitted by M. Etienne de Fedor. It is intended to devote it chiefly to press messages. The article of a journal which is to be forwarded by telegraph to another journal is first set up in ordinary type in a column and then stereotyped. The block is afterward sent to the telegraph office, and serves as original of the message. M. Fedor claims that the rapidity of the transmission may reach about 1,200 letters per minute, or about 14,000 words per hour.

The Western Union Policy.—Mr. Jay Gould is credited with the following expression of opinion: "We have now passed dividends and can afford to wait till the issue is decided, and in my judgment that event is one or two years distant. I guess our rates everywhere are as low as those of our competitors, and it seems to me that we can afford to keep them low better than they can. In the meantime, reduced cost is educating people to telegraph, and when our rivals lie down, Western Union's policy will be to keep rates so low that no other telegraph enterprise will be able to live in competition. I am doing nothing in the market—have no Western Union that I would sell, but I have sat down to see the fight out, and you may be sure I will not rise till it is over—and on our own terms, too."

Sending Pictures by Telegraph.—The *British Journal of Photography* mentions the fact that a patent for sending pictures by the telegraph wire has recently been taken out. Photography is an essential in the process. Mr. Grimnill, of Kirkmaiden, Wigton, has patented a system of photo-telegraphy, of which the following is a description: The picture is projected in sections, as it were, upon selenium cells in the circuit of the wires, and so causes a greater or less number of subsidiary currents to be switched on to an incandescent lamp at the receiving end, the brightness of the light following the intensity of the spot of picture thrown upon the selenium. Here the photography is of service. The lamp is focused on to a plate, and its varying intensities fixed upon the photographic tablet.

The Canada-Australia Cable.—Negotiations have been going on quietly for some weeks for laying a cable between Vancouver Island, British Columbia and Sydney, Australia. As such a cable would greatly increase American trade with the Australian colonies, the correspondent of the *Telegram* saw Sir Francis Bell, the London agent of the New Zealand Government, and inquired about the prospects. He said: "Yes; negotiations between a private company and the agents of New Zealand and Canada have gone on for some weeks. The company wishes at once to lay a cable from Vancouver Island to Sydney. We fully see the importance of this line, both for American trade and in case a Russian war cuts off the cables of the Eastern route. But this company asks Australia to guarantee £70,000 interest yearly. No, I tell them that the Australian Government, though born only yesterday, so to speak, has its eyes open all the same. We can build such a cable for a yearly interest of £80,000, own it and get all the receipts toward the interest. Naturally, therefore, all negotiations are stopped till a more reasonable proposal shall be made. I am convinced that such a cable will be laid within five years. It is a vital matter to the Australian colonies to have a second line of communication with England. This line will all be through British territory and will offer safer and cheaper cabling than is to be had at present. South Australia objects to the cable, of course, because it owns the present land lines to Sydney."

THE TELEPHONE.

The Peoria Co-operative Telephone Company, of Peoria, Ill., has been incorporated by Benj. Warren, Jr., and others with a capital stock of $250,000.

The Westmoreland Telephone Company, of Greensburg, Pa., has been formed with a capital of $10,000. Mr. W. A. Hoff, of Greensburg, is its treasurer and attorney.

Blissfield, Mich.—According to the local *Advance*, the village will soon be "a network of telephone wires," as the Lamont molecular telephone is now being put in by everybody there.

Providence, R. I.—It is understood that the Providence Telephone Company will introduce the multiple system of calling patrons early next month instead of the present method.—*Providence Journal*.

Police Telephones for New York.—The New York *Tribune* comes out strongly for a police telephone service in New York, and points to the good work done in Brooklyn with the system operated there by Superintendent Mason.

Acoustic Telephone Exchanges.—A correspondent sends us a clipping from the Grand Rapids, Mich., *Eagle* of January 25, 1884, in support of a claim that the Willard system antedates all other acoustic exchange systems. The item describes a Willard exchange at St. Ignace, Mich., with forty subscribers, at a rental of $2 per month. The instrument is highly spoken of.

The Telephone in France.—M. Granet, French Minister of Post and Telegraphs, has formed a project for reorganizing the telephone service of his country. According to the *Journal des Débats*, a company is to buy up, on account of the State, the lines temporarily conceded to the Société Générale des Téléphones, and it is to work for thirty-five years without any guarantee of

interest, while it is to lay telephone lines wherever they are required. The yearly subscription is to be 400fr. for Paris, and 300 fr. ($60) for the departments. The capital is to be 25,000,000fr., or $5,000,000, with power to raise three times the amount by debentures. At the expiration of the concession the lines will become the property of the State, which also reserves to itself 15 per cent. of the profit.

The St. Louis Convention.—Secretary Barney has issued the following notification: "To accommodate delegates from New York and the East to the next annual meeting of this Association, which commences at St. Louis on Sept. 7 next, I have arranged for special cars from this city through, at the rate of $32 for the round trip, providing a sufficient number of tickets are sold. The Pullman sleeping car charge will be $6 each way additional. The train will leave by the Erie Railroad, foot of Chambers street, North River, on Sunday, Sept. 5, at 6 P. M., arriving at St. Louis on Tuesday, Sept. 7, at 7:30 A. M." Application for accommodation should be made at once to General Barney, at the Association offices, 234 Broadway.

Dealings in Telephone Stock.—Speaking of telephone securities, members of the Stock Exchange, says the Boston *Herald*, are puzzled over the law of commissions. A variety of charges has been the rule for some months, and so confused has the matter been that it is almost dangerous to mention the subject, lest a misstatement be made. When the by-laws of the Exchange were reconstructed last spring, a change was made in telephone commissions, with a view to encourage trading in large lots. The commission on 50 shares and more was made 12½c. per share for New England and Erie and 25c. on Bell, or so some of the members understood. Double this commission was charged for less than 50 shares. There was a rule that double this commission should be charged when a stock sold at twice par. Some have charged 25c. for lots of Bell of any size, and some have endeavored to adhere to the rule varying the commission with the size of the lot. The advance in Bell to 200 (twice par) brought the matter to a head, and it has been decided that the rule varying the commission is abrogated by some technical informality in dating it, and that the commission shall be 50c. per share for any number of shares of Bell and 25c. per share for any number of shares of New England and Erie. By and by the Exchange will rise to the simple New York practice of ⅛ per cent. (12½c.) commission on everything.

THE ELECTRIC LIGHT.

Rutland, Vt.—The new company will operate its plant with a 125 h.-p. engine, and will have lights running in a month.

New Bedford, Mass.—The Edison Company is now enlarging its station and putting in a 125 h.-p. Westinghouse engine.

The Port Jervis, N. Y., Electric Light Company, has a capital stock of $30,000. Mr. George M. Beebe is one of the incorporators.

Grinnell, Ia.—The capital stock of the Grinnell Electric Light Company is $20,000. Mr. Willard Kimball is president of the organization.

The Minonk Edison Electric Light Company, of Chicago, Ill., has been incorporated by M. T. Arms and others with a capital stock of $4,000.

Buffalo, N. Y.—The Brush Company now has seventeen dynamos in its station, having lately added two, and a 60 h.-p. Westinghouse engine to drive them.

New Hampshire.—The Dover electric light plant is to be in operation by September 20. The Thomson-Houston people have an exclusive contract in Keene for one year.

Fairfield, Me.—The electric light company that has incorporated at Fairfield has Mr. A. F. Gerald as president and Mr. Everett Tollman as treasurer. The capital stock is $10,000.

Westinghouse Plants.—The contract for lighting the New Globe Yarn mill, Fall River, has been awarded to the Westinghouse Company. Three hundred incandescents will be furnished. Westinghouse, Church, Kerr & Co. have recently completed a fine installation at the Fort William Henry Hotel, Lake George.

The Fort Wayne Jenney Company is to put in a large plant at Orange, N. J. for city and private lighting. A large contract for city lighting has been secured against active competition. Both tower and low lights will be used. The Batavia (N. Y.) Gas Company takes a plant of 60 arcs, and 100 more lights have been ordered for New Orleans. One of the New Orleans circuits is 30 miles long.

The Household Electric Light Company, of Boston, agent for the Mather Company, issues a remarkably neat and instructive pamphlet, giving information in regard to the system and illustrating its statements with views of the machine and incandescent lamps. A useful list is given of the numbers and sizes of the machines for arc and incandescent lighting and of the motors. The Household Company contracts for complete installations, including engines and boilers.

Bangor, Me.—The Thomson-Houston plant at the above place is to be enlarged by the addition of a 45 arc light machine and a 300 incandescent machine. The new 100 h.p. boiler will be made by the Penobscot River Boiler Company, of Bangor, and the Armington & Sims Company will put in the new 50 h. p. engine. The boiler will be set with the Jarvis furnace. Mr. Fred S. Palmer, the superintendent, hopes to have 150 incandescents running by August 15.

The Hefner-Alteneck Standard for Light.—Dr. Bunte has recently experimented with Hefner-Alteneck's standard lamp, burning amylacetate by means of a solid wick 8.3 millimeters in diameter, and has added certain improvements by which the height of the flame can be more accurately adjusted. He has also observed that the purity or otherwise of the atmosphere in which the lamp burns has a very marked influence on the amount of light given out. Photometric rooms are generally so closed up from all sides that ventilation is imperfect. Special attention should be paid to this point, as the lamp will only give one standard candle if burning in a quiescent and pure atmosphere. The wick tube must be eight millimetres wide, and the total height of the flame must be forty millimetres, and the lamp should be left to burn at least for ten minutes before a measurement is taken.

APPLICATIONS OF POWER.

Point of Pines, Revere Beach.—One of the special attractions advertised for the great "children's festival" was a ride on the electric railway.

Lawrence, Mass.—A company has been organized at Lawrence, Mass., to manufacture electric motors to propel street cars, under the patents secured by Mr. C. A. Jackson, of Haverhill, Mass. The capital stock is fixed at $1,000,000, and the company purposes building shops of its own.

The "C and C" Motor, the invention of C. G. Curtis and F. B. Crocker, of this city, is attracting some attention. As now made, the motor is intended for small work, and is specially suited to the operation of sewing machines. The president of the "C and C" Company is Mr. G. M. S. Horton, and Mr. J. B. Stearns, inventor of the duplex, is vice-president. A very efficient primary battery goes with the motor, making a good equipment for small power uses.

Allegheny, Pa., is to have an electric street railway on Federal street, beginning at the city market house, running up Federal street to Perrysville plank road, and on that to the second toll gate. The directors in this railway are: O. P. Scaife, President; Arthur Kennedy, Secretary; Wm. Thaw, Jr., J. B. Scott, J. A. Parke and C. Caldwell. It is the intention to extend the line to the corner of Market and Liberty streets, Pittsburgh. The name of the company is the Observatory Hill Street Railway Company.

Pittsburgh, Pa.—An electric railway is to be constructed on the south side. The route extends from South Thirteenth street to Mt. Oliver, passing through Allentown and Knoxville. The total length of the route is two miles, with grades up to 14 ft. in 100 ft. The parties at the head of the enterprise are: Thos. Evans, President; Henry Stamm, Treasurer; James W. Patterson, Secretary. The company is named the Pittsburgh, Knoxville & St. Clair Street Railroad Co. It intends to run five motors simultaneously, so as to start a car every five minutes.

Electric Launches.—The Electric Power Storage Company have recently completed another electric launch, which has just been tested on the Thames. It was arranged that the Duke of Bedford's launch should be run at the same time, and the two electric launches started from Kew Bridge up to Teddington, and thence back to Millwall, causing considerable sensation. The Duke and Duchess of Bedford and others were present at the trial, which was most successful throughout, and more than answered the expectation of the builders with regard to speed.

Scranton, Pa.—The Van Depoele Electric Manufacturing Company has just contracted with the Scranton Suburban Railway Company to furnish 2¾ miles of the road with an electric equipment. The cars will be the finest that the Pullman Company has ever turned out for street railway use, and they will be made under the Van Depoele Company's directions. This makes another practical commercial road operated on the Van Depoele system.

Philadelphia.—The Union Electric Company gave an exhibition of their system on the Ridge Avenue line on July 23. The *Record* says: "The demonstration was made in the presence of a large number of scientists and other distinguished gentlemen, who pronounced it a thorough success. The electrician of the road, William M. Schlesinger, and his assistant, Henry Clay, Jr., have been working hard to perfect the machinery since the car was first placed on the road last fall, and it has now reached their expectations. The car last evening made several trips. On each occasion it was loaded with passengers, and the motor worked without a flaw. Loaded with passengers, it was moved along at the rate of nearly eight miles an hour, and without any perceptible jerks. It was stopped and reversed at the will of the engineer."

Electricity on the Farm.—On the estate of the Marquis of Salisbury, in addition to the various operations of lighting, pumping, pile-driving, weed-cutting in the river, and others, another application of the power has just been perfected by Mr. Shillito, the resident electrician of the estate. This year it has been decided to chaff the green food before placing in the silo, and this arrangement has necessitated the placing of the chaff-cutter used in cutting up the rough grass some twenty feet above the ground. The electrical power is used not only for driving the cutting machine, but also for elevating the grass to the level of the cutter. Some four tons of rough grass are raised and cut per hour by this means. The generator, a 16-light "Brush" machine, driven by a water wheel, is situated a mile and a half distant, on the banks of the river Lea; the electrical power being transmitted to a dynamo of Siemens Brothers D 2 type, specially wound to work as a motor with the "Brush" machine. The same source of power is also brought into use in working the elevators at the various hayricks on the estate.

PERSONALS.

Mr. John Crawford, who is well known in connection with the introduction of the telephone in Russia, has now been appointed superintendent of the Central Division of the Pennsylvania Telephone Company, to take effect Aug. 1. Mr. Crawford's headquarters will be at Reading.

Mr. Cyrus Field has latterly devoted his leisure to winning libel suits. In his suit against James Gordon Bennett the Sheriff's jury in London on July 26 awarded the plaintiff $25,000 damages. The defendant was condemned to pay all the costs of the suit also.

Mr. H. E. Fanshawe of this city has brought suit for $50,000 against Mr. John B. Alley, of Lynn, for libel and slander. Both have been connected prominently with the Postal Telegraph Company, and it is out of troubles in connection with that company that the present suit has arisen.

Mr. Thos. A. Edison proposes to build a new laboratory for himself at Llewellyn Park next year. Meantime he is working quietly at the Newark Edison shops. He says he is "simply trying to cheapen electric lamps and the carbons." He is also studying earth currents and their availability for telegraphic purposes. He will give this subject great attention on the occasion of his next visit to Florida.

Capt. Leonard Whitney, special agent of the Western Union Telegraph Company in Washington, died in that city last week. The deceased had been in the employ of the Western Union Company for twenty years or more, most of the time as cashier or manager of the office in Washington. In 1883 he was made special agent of the company in Washington, and had held that position ever since. He leaves no immediate relatives.

M. Marcel Deprez.—The Rothschilds some time ago gave M. Marcel Deprez unlimited credit for the prosecution of researches in the problem of the electrical transmission of force. The results of the researches have just been submitted to a committee of inspection composed of 38 scientists, and the committee by a unanimous vote have approved the report and pronounce the results obtained by M. Deprez worthy of the highest congratulations. M. Deprez' experiments have already been described in these columns.

Mr. W. J. Sefton, the popular and efficient Secretary of the New York Electrical Subway Commission, has resigned that position and accepted the office of Secretary to the Consolidated Telegraph and Electrical Subway Company. The office was neither sought for nor expected by Mr. Sefton. The Consolidated Company found itself in need of a secretary having familiarity with the perplexing underground question, and at once made Mr. Sefton very flattering proposals. Mr. Sefton is well qualified for the work that now falls to him, and will, we think, materially help the company to make a good record for itself.

Mr. Erastus Wiman has been the subject of much newspaper talk lately. One pen hits him off thus: "A man slightly under the medium height in a gray business suit with a Jacqueminot rose in his buttonhole and an intent, earnest, yet good natured expression on his English-looking features. In his muttonchop whiskers he looks like a Londoner, but his activity is that of a born American. It is Erastus Wiman. He is one of the numerous foreigners who have won wealth and distinction in this country. He was born in 1834 in a little village near Toronto. In the summer months he worked in the fields for 50 cents a week; in the winter he picked up a scanty school education. His best education was in a printing office in Toronto, where he obtained employment as a boy of 15. He remained there until he was 19, acting first as a roller boy for an old-style Adams press and finally as a typesetter. His wages ranged from $1.25 to $5 a week." The article then sketches his rise as journalist, financier, commercial arbiter, railway magnate and great amusement entrepreneur—but always true Canuck and good American citizen.

Dr. Otto A. Moses.—A petition has been received by the New York Board of Education and by the Special Committee on Technical Education from Dr. Otto A. Moses, suggesting the advisability of teaching scholars (before they receive technical instruction) the "fundamental facts which lead to our becoming acquainted with the laws of nature." Dr. Moses advises familiarizing grammar school scholars with the "qualities and uses of the most ordinary materials with which they daily come in contact—as coal, iron, glass, wood, stone, etc.;" also with the "qualities of heat, light, electricity and magnetism and sound, with chemistry and geology." All these things it is proposed to teach in each school once a month for forty-five minutes at a time by means of elementary lectures, the lectures to be delivered to the pupils when assembled in the morning and "to be accompanied by experiments of such character as to vividly impress upon their young minds the facts illustrative of the principles they should learn. Ten of these elementary lectures would be sufficient to give all the scientific principles a child should know before he commences to receive any technical instruction. After he has listened to these he may be taken from any grade in the school and be put into the technical classes which are proposed to be established." The matter is likely to receive careful attention.

Mr. Maurice B. Flynn is a large figure in New York politics to-day. The following appears in the *Tribune* regarding his connection with the Subway Commission: "The bill that Senator Daly introduced in the Legislature to create a commission was drawn up by Mr. Ivins, formerly private secretary to the Mayor, and now City Chamberlain. The Mayor is largely interested in one of the electric light companies. As originally drawn that bill was unconstitutional and would have defeated the very purpose for which Senator Daly introduced it; whether or not that was the intention of the person who originated it cannot be said. But Flynn, who does not allow anything in the way of a profitable city contract to pass without he gets his share of the plunder, was quick to see the possibilities of this thing. As drawn by Ivins the bill lodged the power of appointing commissioners in the mayor's hands. Flynn had some amendments drawn up which it was believed would make the bill constitutional, and one of his amendments lodged the power of appointment in the hands of a commission composed of the Mayor, Controller and Commissioner of Public Works. As Squire owed his place to Flynn, this offered a leverage for Flynn to secure at least one member of the commission. He got his father-in-law named a member of the commission, and went to work at once to get control of the contract. I think you will find that he has a large interest in the new company, and I am told that Governor Hill is also represented in it."

MISCELLANEOUS NOTES.

The Stuart Electrical Supply Company, of Bangor, Me., has been incorporated with a capital stock of $250,000, with C. J. Stuart as president.

A Big Broil.—The great power and heat of lightning have not been overrated. On Sunday night last a bolt of lightning killed and roasted 300 spring chickens in New York at a single stroke.

Transmission of Power.—The Marquis Luigi Fonti has conceived a new method for the transmission of power, consisting essentially of decomposing water by the current of a dynamo, driven by hydraulic power, and transmitting the gas by conductor to gasometers at the receiving station.

Frictional Electricity.—A suggestion has been made to utilize the electricity so freely obtained in many industrial operations by means of a secondary generator. The electricity is to be collected by means of brass points connected to continuous or Leyden jars, from which it is discharged through a long coil of fine wire, forming the primary, the secondary being of thick wire, from which it is hoped to get the electricity for use at a low potential.

Galvanic Underclothing.—A Spanish inventor has recently obtained a patent in England for converting flannel underclothing into a sort of galvanic battery, so that the wearer may be always under the influence of the "current." In a bath composed of the oxides of iron, copper, zinc, and tin, mixed in fine powder with gum-water, the flannel is soaked and thus becomes charged with electrodes which are excited by the natural perspiration, and thus gives off a weak but constant electric current, which may or may not effect a cure, according to the faith of the wearer.

A New Contemporary.—*Industries: A Journal of Engineering, Electricity and Chemistry*, is the name of a weekly journal which has just entered upon its career. To judge from the appearance and contents of its first number, just at hand, we have no hesitation in saying that it deserves popularity and properity, and should take rank at once among the standard technical papers. Electricity occupies a goodly space in the first issue, and will continue to be made a prominent feature, as the title indicates. Mr. J. F. Butterworth, Manchester, Eng., is the publisher.

Trees Struck by Lightning.—The question has been asked why oaks and elms are especially liable to be struck by lightning. It was declared in 1787 that the elm, chestnut, oak and pine were the trees most often struck in America, and in 1860 G. J. Symonds stated that the elm, oak, ash and poplar were the most frequently struck in England. A Madgeburg record, covering ten years, reports injuries to 285 trees, 165 being oaks, 34 Scotch firs, 32 pines and 20 beech es. It has been suggested that the frequency with which oaks are struck is due to the presence of iron in the wood.

A New Alloy of Aluminium.—The applications of aluminium are now considerable, and M. Bourbouze, the French physicist, has added to their number by employing an alloy of the metal with tin for the internal parts of optical instruments, in place of brass. The alloy he employs consists of ten parts of tin and 100 parts of aluminium. It is white, like aluminium, and has a density of 2.85, which is a little higher than that of pure aluminium. It is, therefore, comparatively light, which is an advantage for apparatus where lightness is desired. It can be soldered as easily as brass, without special means, and it is even more unalterable than aluminium to reagents. The attention of electrical instrument makers is called to it, especially for apparatus of a portable character.

New Primary Battery.—Dr. S. T. Stein, of Frankfort-on-the-Main, considers that the best battery for medical purposes would be one in which the exciting liquid does not evaporate, so that no salts are formed on the upper edge of the jar. Dr. Stein has conceived the idea of adding gelatine to manganese batteries, finally adopting a mixture of gelatine, glycerine, sal-ammoniac, and salicylic acid, the electrodes consisting of a carbon cylinder, with bioxide of manganese for the positive pole, and a zinc pencil for the negative pole. The internal resistance is, according to size, from ½ to ⅛ ohm, and the E. M. F. from one to 1.085 volt. The chemical reactions of the new battery are the same as in the Leclanché.

New Wire Tester.—A wire tester, specially designed by Mr. W. H. Bailey, has been constructed by Messrs. W. H. Bailey & Co., of the Albion Works, Salford, Eng., for the use of the South Australian Government Telegraph Department. The tensile strength of the wire is tested in an ingenious manner by means of a column of mercury, and when the wire breaks, a back-pressure valve prevents the return of the mercury, so that the breaking strength of the wire is thus exactly indicated. There is also a diagram attachment used with the machine which indicates on metallic paper the elongation of the wire before the maximum breaking strain of the wire is reached. The arrangements of the machine are so simple that levers and springs are entirely dispensed with.

SPARKS AND FLASHES.

Electricity No Reducer of Gas Dividends.—An official of the St. Louis Gas Company was recently on the witness-stand in court in a case of slander. The slander consisted in calling a man an idiot for selling all his gas stock for fear that electricity would break up all the gas companies. "Has electricity interfered with the value of your gas stock?" was asked. "To a slight extent." "If you were to lose half your patrons, would your stock still pay a dividend?" "Certainly, sir. We should simply increase the bills of the other half to make up the deficit.—*Wall Street News.*

An Old Time Special Dispatch.—The following story, told by Senator Davis, of Maryland, is going the rounds of the comic columns of the papers: They have some original characters in these mountains. Once I heard a really eloquent sermon at a church 10 miles north of Deer Park. But you can imagine my surprise when, in the midst of a burst of rhetoric, the reverend orator clasped his hands in ecstacy above his head, and, lifting his eyes heavenward, like a saint, exclaimed: "My friends, all the world shouted for joy when the good news of Christ's birth flashed over the wires."

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2, a 3; Western Union, b 66¼, a 66⅛.

Telephone.—Am. Bell, b 212½, a 213; Erie, a 29½; New England, b 40⅜, a 41; Mexican, b 1, a 1⅝.

Electric Light.—Edison, b 120, a 125.

BUSINESS NOTICES.

The American Fire Alarm Telegraph.—It has happened lately that several large fires have impressed on the authorities of our towns and cities the necessity of putting in a good fire alarm telegraph. The result has been that the Gamewell Fire Alarm Telegraph Company, of New York, Boston and Chicago, has found its system in brisk demand. Over 150 cities now have it, and several others contemplate its early introduction. The company owns also a good system of police telephone and signal telegraph now in use in Chicago, St. Louis, Cincinnati, Philadelphia, Washington and several more large cities.

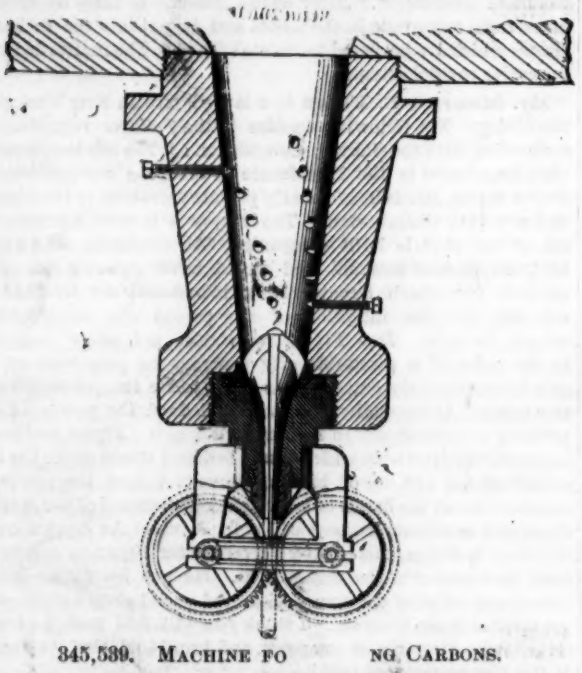
Glenn's Sulphur Soap
Heals and beautifies, removes pimples and blemishes; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure, 25c., 50c. and $1.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JULY 13, 1886.

345,292. Electric Clock; Richard E. Fenner, Chicago, Ill. Assignor of one-half to Charles K. Giles, same place. Embraces a spring-balance of a clock, an electro-magnet, a vibrating armature, a vibrating impulse-lever connected to the armature and arranged to act upon the arbor of the balance, a retractile spring connected with said lever, and an automatic circuit-breaker and maker.

345,325, 345,326. Telephone Exchange Switch. Charles E. Scribner, Chicago, Ill., Assignor to the Western Electric Co., same place. 1. As shown in the cut, it consists of the frame provided with the lug or contact-point, the spring mounted on the frame and insulated therefrom, the piece of insulating material at the free end of the spring, and the plug, whereby the spring is lifted from the contact-point. 2. Consists in a plug having two insulated points, one of which is



345,539. MACHINE FO NG CARBONS.

yielding, and separate connections leading from said points, so that when the plug is inserted in a spring-jack or other device the contact of said device may be readily tested. The points of a spring-jack switch placed upon the rear of a switch-board may thus be led out so as to be accessible at the front of the board, and the operator, by using a test-plug, may rapidly test out all the lines and connections of an exchange without going to the rear of the board or disturbing the cable-connections between the boards.

345,354. Motor; 345,335. Incandescent Lamp Socket; 345,336. Commutator Brush; Elibu Thomson, Lynn, Mass. 1. As illustrated, there is combined with the motor an inclosing iron box for the field magnets, the commutator and the armature, the box being provided with the screened ventilating-opening, and the field magnet for the machine being attached to the interior of the box and projecting inwardly therefrom. 2. Consists, first, in combining with the lamp neck a sleeve of metal or other hard, tough material, from the interior surface of which pins or studs project inwardly into recesses formed in any desired manner in the neck of the lamp, and a cementing material of any desired kind—such, for instance, as plaster-of-paris—applied within the sleeve around the neck of the lamp at the points where the pins or studs engage. 3. It is composed of two or more layers or planes of conducting-pieces, the individual members of which in each plane are capable of making contact independently, not only of others in the same plane, but also of others in the adjoining planes, and are capable of being fed forward between the plates that separate them as they wear away by use.

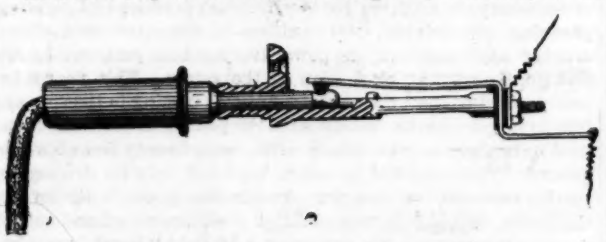
345,882. Coating Wire with Zinc; Edwin H. Hill, Worcester, Mass. The wire is propelled through melted zinc; the invention relates to mechanical details in the construction of the apparatus.

345,383. Electro-Magnetic Apparatus for Separating Ores; H. P. J. Kessler, Oberlahnstein, Prussia, Germany. (See illustrated article.)

345,511. ELECTRODE FOR SECONDARY BATTERY.

345,511. Electrode for Secondary Battery; Achilles Khotinsky, Rotterdam, Holland. Embraces a lead frame having T cross bars (shown in the cut) connected to or extending from a common supporting-piece, the space between said cross-bars being adapted to receive and retain active material.

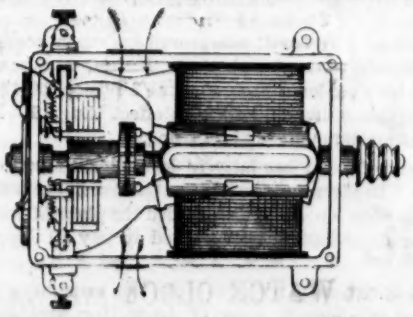
345,539. Machine for Making Carbons for Electric Lamps; Alfred Pfannkuche, New York, N. Y., Assignor to the Forest City Carbon Manufacturing Co., Cleveland, O. As



345,325. TELEPHONE EXCHANGE SWITCH.

illustrated, it embraces a press having a discharge-nozzle provided with adjustable internal projections for varying the pressure, a die, and an automatic cutting mechanism for severing the carbon rod into proper lengths as it leaves the die.

345,541. Regulator for Electric Circuits; Merle J. Wightman, Hartford, Conn., Assignor to the Schuyler Electric Light Co. As illustrated, it consists of any device whereby the flow of current to the translating devices may be regulated, adjusted, or determined, combined with a derived circuit to the



345,334. ELECTRO-MAGNETIC MOTOR.

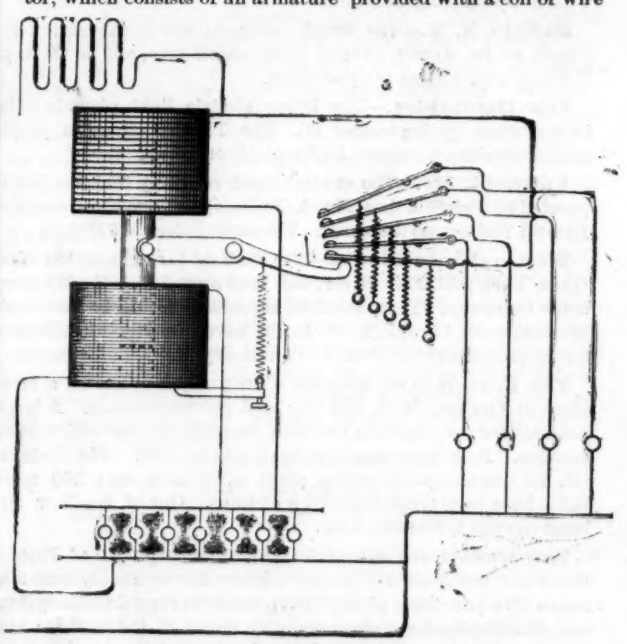
translating devices, containing a coil by which the regulating devices may be set or operated, and a second coil acting on the same devices and combined with suitable means whereby its effects may be automatically varied according to the set or adjustment effected by the operation of the derived-circuit coil.

345,542. Cement for Securing Metal Rings to Electric Lamp Bulbs and for Other Purposes; Albert L. Reinmann, Pittsburgh, Pa. It is composed of calamine, chalk, and adhesive substances such as glycerine.

345,543. Valve for Mercurial Pumps; Albert L. Reinman and C. F. Reinman, Pittsburgh, Pa. The valve consists of a chamber in which is a U-tube, one of the legs of which is of greater diameter than the other.

345,572. Fire Alarm Signal Box; Sidney A. Chase, Everart, Mich., Assignor of one-half to William R. Mapes, of same place. Embraces an inner box, having a crank at the centre of its face operating the signal mechanism, and provided with a series of perforations arranged circularly around the crank-shaft, and having the surrounding portions of one perforation at a lower level than the others, a plug fitting in the perforations and bearing with its shouldered portion against the surrounding portions, and an outer box or casing having a door at a distance from the surroundings of the lower perforation equal to the length of the shouldered part of the plug.

345,641, 345,642. Electric Railway Signals; Malcolm W. Long, Hyde Park, Mass. 1. Relates mostly to the generator, which consists of an armature provided with a coil of wire



345,541. REGULATOR FOR ELECTRIC CIRCUITS.

and mounted on a shaft in proper proximity to the poles of a permanent magnet, and suitable gearing by which a continuous rotary movement is imparted to the shaft and armature from the intermittent impulses derived from the wheels of the passing train, the impulses in this instance producing an oscillating movement in an arm, which, by a suitable rachet or clutch, imparts a rotary movement in one direction. 2. It relates more especially to signals designed for single-track roads over which trains move in both directions, and its particular aim is to combine with one signaling-instrument two generators located on opposite sides thereof. It consists of the magneto-generator and its track connections, whereby it is actuated from passing trains, the electric signal-instrument, electric conductors connecting the generator and signal, and normally closed adjacent to the signal, the mechanism to automatically close the circuit when the generator is actuated, the electro-magnet and its connections to reopen the circuit adjacent to the generator, and the track-connections adjacent to the signal for automatically and momentarily diverting the current to the electro-magnet, whereby the reopening of the circuit is effected at the completion of the signaling action.

345,658. Telephone; James P. Young, Philadelphia, Pa., Assignor of one-half to John B. Dallas, same place. Consists of a microphone having means whereby the contact of the electrodes may be maintained and nicely adjusted when necessary.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.